BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Engineering & Technology
B. Tech. - Civil
New Syllabus

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY) Pune.

Faculty of Engineering & Technology
Programme : B. Tech.(Civil) (2021 Course)
Course Structure & Syllabus
(Choice based credit systems-2021)
B.Tech (Civil Engineering)
Semester I to VIII

Executive summary

Students pursuing engineering studies need to be well equipped and state of art with the latest technological trends and industrial requirements. To produce the students with high caliber and technically sound, enrichment in the curriculum content and various quality initiatives are needed. This is possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Curriculum Development History

- In ambits of Deemed University- 2000
- Curriculum of SPPU Accepted
- First Revision in 2004
- Second Revision in 2007
- Third Revision in 2011
- Fourth Revision in 2014
- Fifth Revision in 2018 was expected

The proposed curriculum is developed to inculcate the advanced engineering skills to cope up with upcoming industrial and societal needs. Students will be imparted with advanced contents from respective field and innovative delivery methods.

To inculcate the advanced engineering skills and knowledge, branch specific courses have been introduced from the Sem – I itself. There are total 38 theory courses, 4 vocational courses, 3 MOOCs, 2 projects, technical research paper writing, no. of application software courses, no. of practical based courses, 6 Industry taught courses along with 60 days exclusive internship have been incorporated in the curriculum with 230 credits and 6500 Marks.

There will be collaboration with the prominent industries to execute the vocational courses. These industries will deliver the content and execute the hands-on session to inculcate the required engineering skills of particular course.

Also, one course per semester will be entirely dlivered by the expert/s from the industry of respective field for which blended teaching learning will be adopted.

Students will apply the knowledge of respective courses and develop the prototype/ model as a part of project based learning.

To give the experience of technical writing and research article, students have to develop the two projects in pre final and final year respectively and shall submit the research article to reputed journal for publication. This will inculcate research aptitude among students and will enhance the research profile of institute also. Incorporation of various practical based courses in respective discipline, will give hands on experience to students to understand the engineering concept in better way. Nowadays all practices and process in the field are being computerized and automated. Hence, it was pertinent to increase software content in the curriculum. It was demand from the industry that every engineer should be conversant with Software/Programming/Data analysis and automation process. Hence, courses to such as C, C++, Python, Machine Learning, Artificial Intelligence are added in curriculum of all discipline. Students who wish to develop their career in the IT field, significant courses related to computational engineering and application software have been incorporated in the curriculum of each discipline.

National Education Policy is insisting the Online and Digital Education and Ensuring Equitable Use of Technology. To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Courses to all the students to provide an affordable and flexible way to learn new skills, advance the career and deliver quality educational experiences at scale.

2. Curriculum Content

- Curriculum derived from Latin word ‘Currere’, which means a race course or runway on which one runs to reach a goal.
- Curriculum is the instructional and educative programme by following students achieve their goals, ideals and aspirational life.
- Curriculum is a standards based sequence of planned experiences,

  which students practice and achieve proficiency in content and applied learning skills
- Its confidence building process
- Its total learning experience of the individuals
- Its interactive system of instructions and learning with specific goals , contents, strategies, measurements and resources.
- The desired outcome of curriculum is successful transfer / development of knowledge, skills, and attitude.
- Curriculum should lead to transformation of student to contributory member of the society

We tried to develop curriculum , which will meet these concepts.

Curriculum is the outline of concepts to be taught to students to help them meet the content standards. **Curriculum** is what is taught in a given course or subject. It refers to an interactive system of instruction and learning with specific goals, contents, strategies, measurement, and resources. It is a course of study that will enable the learner to acquire specific knowledge and skills. A **curriculum** consists of the "roadmap" or "guideline" of any given discipline. Both the philosophy of teaching of the instructors as well as of the educational institution serve as two of the principles upon which a curriculum is based.

In Engineering, a **curriculum** is the combination of instructional practices, learning experiences, and students' performance assessment that are designed to bring out and evaluate the target learning outcomes of a particular course. It is the goals, assessments, methods, and materials used to teach a particular skill or subject and includes thinking under "skill.". The curriculum needs to be planned and designed in such a way so as to sequentially improve students' knowledge and skills.

Placement is an important parameter and outcome of a good curriculum, which satisfy the need of good placement. The written curriculum is a plan of what is to be taught so that the student gets good placement. For this , a variety of technical and non-technical courses that are required to complete a specific degree so as to help the student for placement are included in the curriculum. In addition to technical knowledge , it should also include social behaviors as well as content and thinking skills.

Overall, the curriculum should be such that it should develop a student in a good job seeker, good entrepreneur and also a good human being.

All the above aspects are taken care in the curriculum of **B. Tech-2021** course. This will develop different abilities in a student.

3. Curriculum Preamble

The curriculum 2021 is formed such that it will develop different abilities in a student. It a combination of blended teaching learning process in which both online and offline teaching is a part of the curriculum. In order to develop affection towards the discipline a student has selected, core discipline courses are included right from first year. This will also help to give the overall idea about the branch / discipline to the student.

Interaction with the industry is increased in this curriculum by introducing two new concepts –

1. **Vocational Course** and 2. Industry Taught Course.

Vocational Course (VC), a student will able to develop a specific skill set from the relevant people/ agency from the industry. This will add in gaining new skill sets required by the industry. Such Vocational Courses are included from Semester III to Semester VI of the curriculum. Department also design vocational course relevant for the discipline, which add practical knowledge to students. The vocational courses should be discipline specific. 4 vocational courses and 8 credits are integrated with curriculum.

Industry Taught Courses (ITC) are the courses which will be taught by the people from industry who are experts in the relevant field, either partially or fully. This will provide a scope to students to gain the latest knowledge as used in industry and also to have direct one on one interaction with the industry. This will develop a confidence among the students. Such teaching by industry experts will be as per their availability, if required online and other than official college hours also. Thus, there is a blend of online and offline teaching, knowledge from academicians as well as from industry. Total six Industry Taught Courses are included in the curriculum.

Industry Internship of 60 days at the end of Semester VI integrated with curriculum, will also add to the interaction with the industry. A student will avail his training in industry or on site or in any design office or research organization as allotted to him/by the institute. A separate logbook will be maintained by the student during this period duly signed daily by the competent authority.

Project Based Learning is a part of almost each course of the curriculum. Small projects on relevant topics will be allotted to the students as a part of term-work of that course. This will inculcate the habit of applying the knowledge learnt to solve practical problems.

Two Projects are included in two stages, one in third year (Sem V and Sem VI) and the second in final year (Sem VII and Sem VIII). Improvement in Research, thinking ability and application of theoretical knowledge to develop practical ideas is the main purpose of these projects.

Publication of a research paper is the outcome expected from the Project work and as a motivation, separate credits are allotted for this. Students are expected to write research article based on Project-I in standard journals in final year. Guide for Project -I will help in writing the research article.

To develop the self studying, self-learning skills, each student has to join the **MOOC/NPTEL** courses and will get the certification of the respective course. This will also give him/her a chance to get the knowledge from teachers from well known institutes of national repute. Three such MOOC/NPTEL courses are included each in Semester III, Semester V and Semester VII and separate credits are allotted to it.

Various new courses are introduced in the curriculum thereby introducing the current and latest technology to students. Basic Science and Engineering Science course contents are designed to match the requirement of the specific disciplines.

Number of software related to that branch/ discipline are included as part of the curriculum. This will help the students to get good placement.

Few soft courses are introduced to non-circuit branches. This will give a soft feel to such branches and also to inculcate confidence among the students.

In addition to technical abilities, a student needs to be developed as a good human being. For this, he will complete social activities in Semester IV and Sem VIII.

Thus Curriculum-2021 satisfies the requirements of National Education Policy-2021.

"Knowledge, Skill, Behavior" are the three attributes that are inculcated in a student when he completes his B.Tech. course under Curriculum-2021.

Recommendations considered

- UGC- Quality mandate
- National Education Policy (NEP)

- AICTE model curriculum
- Curriculum of International Universities
- Curriculum of Indian Universities
- Feedback from HR of industries called for placements
- Market perception

Methodologies Adopted In Designing Curriculum (2021-22)

- 19 Basic Points for design of Curriculum
- Listing of common points (credits, marks, No. of courses, common courses, industry taught courses, vocational Programmes etc.)
- Conducted series of meetings
- Conducted in depth one on one discussions with HoDs
- Planned three workshops,
- Eminent experts from Industry, IITs, IISER, NIT, SPPU, Central Universities were invited for workshops
- First workshop - Course structure, Titles of courses, Industry taught courses, Vocational Courses.
- Second workshop - Content of first and second year courses
- Third workshop - Content of third and fourth year courses- (Planned)

4. Salient features

- Total 250 contact hours teaching are incorporated.
- Credit based 38 theory courses being offered to achieve global standards of quality.
- Curriculum offers practicals to more than 80 % (~ 30 theory courses) theory courses.
- Total 230 credits (6500 marks) are offered for the entire B. Tech. programme.
- Theory courses contains 60% of courses and 20% to practical courses.
- Tutorials (6 Credits), online courses (6 Credits), vocational courses (6 Credits), projects (18 Credits), internship (3 Credits), Research Publication (2 Credits) and social activities assigned (4 Credits) contains remaining 20% of credits
- Blended education policy is adopted considering its importance. 20% courses are taught in online mode.
- Incorporation of 6 industry taught courses is one of the important and strategic step.
- Adopting 4 vocational Programmes in cooperation with industries, renowned agencies, universities will improve skillsets of our students.
- 60 days industrial internship to meet the requirements of industry.
- Including of 2 projects to enhance technical skills & self learning.
- Research paper based on Project-I will inculcate research aptitude among students.
- Project based learning practically for all courses will enhance the ability of application of knowledge and problem solving aptitude.
- NPTEL/ MOOC courses in online mode are introduced as integrated part of the course structure.
- To understand social responsibility and social activities of weightage of 4 credits are integrated part of the course structure.
- Quantitative Techniques and communication courses are introduced to enhance the analytical ability of students and address employability.
- Wide range of elective courses have been offered to provide the choice, to explore the knowledge in their domain of interest.

Salient Features

Sr. No.	UGC (Quality mandate)/ NEP2020-Recommendations	Curriculum (2021-22)
1	Learning Outcome-based Curriculum Framework (LOCF)	a) Programme outcomes and course outcomes are being made ready
2	Imparting Life Skills to Students.	a) Quantitative techniques b) Communication skills c) Bridging gap with Industry by vocational courses d) Self learning by NPTEL/PBL/Two projects
3	Social and Industry Connect	a) 6 Industry taught courses b) 4 Vocational courses c) 60 days internship d) Time and credits for social activities
4	Promotion of Research and the Creation of New Knowledge.	a) Research publications based on projects b) Project based learning
5	Blended Education	a) 15% courses in online mode b) NPTEL/MOOC courses in online mode
6	Technology Enabled Learning/Self Learning	a) NPTEL/MOOCS
7	Software Applications	a) Programme specific softwares and Software application Courses

5. Curriculum Details

5.1. Courses-Theory/Practical's/Tutorials/Units/Co-mapping and Engagement

Courses-Theory/Practical's/Tutorials/Units/Co-mapping and Engagement, University exam and internal assessment

The B.Tech. 2021 offers Credit and Outcome based curriculum with total 230 credits, required for graduation with a Bachelors' degree (B.Tech). The Under-Graduate Programme (B.Tech) is of four years duration i.e of eight semesters (two semesters/year).

Engagement of Courses:

The courses in revised curriculum structure of B.Tech. program are categorized under Core courses, Elective courses, Engineering Science courses and Basic Science courses. These courses are taught to students by engaging them through lectures, practical or tutorials by respective course coordinators. From semester I to VI, there are five (lecture engaged and assessed) courses and in semester VII and VIII there are four (lecture engaged and assessed) courses which are mandatory. All the courses have varying hours of engagement and credits. Theory lecture engagement varies between 3 hours to 4 hours/week, practical engagement varies between 2 hours to 4 hours/week for the respective courses. The contents of every course is divided into six units. Each unit can be covered in 6 hours or 8 hours depending on the total allotted hours/week of lecture engagement for the respective course. Some courses are solely practical oriented. These courses will be only engaged through laboratory sessions.

Outcome Based Curriculum:

Planning and realization of teaching and learning related to outcome-based curricular model requires that initial element shall be an outcome. It serves as a basis for defining modes of evaluation and validation of outcomes. The curriculum defines the Course Outcomes (COs) and course objectives for every course. The outcomes are assessed through various activities and evaluation of learner's performance in various examination schemes i.e Theory/Practical/Oral/Term work.

Credit Calculation:

The course credits are computed based on the teaching hours per week for that course using the formula as mentioned below.

Credits earned by the Student = Credits earned in Theory (Th) + Credits earned in Practical (P) / Oral (O) + Credits earned in Tutorial (T)

Here, as mentioned above, the credit assignment for Th/P/O/T of any course is based on number of teaching hours of that course. It is as mentioned here:

Number of Credits for Theory (Th) courses = Number of classroom teaching hours per week for that course (1:1 correspondence)

Number of Credits for Practical (P) / Oral (O) courses = Number of laboratory hours per week for that course / 2 (0.5:1 correspondence)

Number of Credits for Tutorial (T) courses = Number of tutorial hours for that course (1:1 correspondence)

Example: If a course has 4 hours of classroom teaching, 2 hours of laboratory session and 1 hour of tutorial, then the credits assigned for that course will be 4(Th), 1(P/O) and 1(T) respectively.

Examination Pattern:

A) University Examination (UE)

The pattern for theory examination is of 60:40, where the learner can earn 60 Marks (maximum) through University Examination (UE) and 40 marks (maximum) are assigned for Internal Assessment (IA). For the UE of Practical/Oral assessment, the total marks allotted are 50. The laboratory assessment is divided into three assessment heads viz. Term work (TW), Practical (P) and Oral (O). The students will be assessed through TW or P or O or combination of any of these for the courses that have practical assessment. 25 Marks are assigned to TW/P/O each, so when a learner is assessed for practical through TW and P heads, he/she will be assessed for 50 marks.

B) Internal Assessment (IA)

The Internal Assessment (IA) for the respective courses will be performed through Unit Tests (UT) and Assignments. Total two UTs of 20 marks each will be conducted and the average marks of these two UTs will be considered. Similarly, course coordinators will design the class assignments in terms of exercises, case studies, real world problems or mini projects, which the learners have to submit from time-to-time, as mentioned by the deadline of each assignment. While designing the assignment, the course coordinators will provide the assessment criteria to the learners and maximum score (marks) for the assignment as well. If there are multiple assignments, then the average of score (from score attained in all assignments) will be calculated and considered as IA marks. This way, the learner will be assessed for 20 marks (maximum) for assignments.

Hence, total marks for UT and assignments are 20 each and so, IA will be of 40 marks. The score for IA is calculated as:

IA Score attained by learner (Max 40) = Average Score attained in UTs (Max 20) + Score attained in Assignments (Max 20)

5.2. Credit Concept: Equivalence

In CBCS 2021 Course structure, the allotment of credits are as follows:

Theory class of 1 hour: 1 Credit

Practical class of 2 hours: 1 Credit

Tutorial class of 1 hour: 1 Credit

Project, Research Paper & Social Activity: 1 Credit

5.3. Vocational course

Vocational learning opportunities play a important role in skill development and employability of student. Vocational courses are ways of implementation of theoretical knowledge in the practice.The importance of vocational development can largely be summed up as the difference between theoretical knowledge vs. practical skills. The vocational courses are based on the teaching of practical skills. These courses are designed to introduce the manual skills in the professional education in addition to the theory. These courses will serve as bridge courses for professional growth and career improvement.

Aims & objectives of vocational courses:

- To provide students with technical knowledge and skills necessary for progressive education in engineering profession.
- To give a better understanding of the emerging of technology.
- To train the student with necessary skills leading to skilled personnel who will be enterprising and self-reliant.
- To enhance the skill of students for becoming self-sustained engineer.
- To reduce the mismatch between the demand and supply of skill man-power.

In this curriculum at B.Tech Programme, there are four vocational courses introduced i.e. in Semester III, IV, V and VI. The courses offered at these semesters are as per the requirement of the programme.

Methodology:

The vocational courses shall be conducted in association with the companies through MoUs. The candidate shall be provided training in the industries in respective area. The training can also be given by the company experts in the college with appropriate infrastructure. Departments can design vocational programme/course as per employability skills for an engineer of respective discipline required. The student shall have to attend the training sessions for at least 4 hours per week. The training sessions shall be organized on weekends or on the extended hours of the college timing.

A faculty-in-charge will be appointed to monitor the functioning of the vocational course as well as monitor the performance of the student for the said course.

The student has to maintain proper record of the training attended throughout the semester and submit the report on the work carried out. The record has to be checked and signed by the faculty –in-charge.

Assessment:

The assessment of the performance of the candidate for the vocational courses shall be in the form of term work and oral. The term work and oral carry 50 marks. The candidate performance shall be evaluated based on the training undertaken by the candidate throughout the semester. Student shall give presentation of skills he learned through vocational courses followed by viva. External examiner for the same shall necessarily from relevant industry.

A total of 2 credits shall be allotted per vocational course per semester.

Certificate:

Every candidate shall be awarded a certificate after successful completion of the vocational course as per the rules & regulations.

The certificate shall be jointly signed by concerned authorities of college and the company.

5.4. Industry Taught Courses

PREAMBLE:

The concept of Industry Offered Courses enables bridging of technological gaps between students and state-of-the-art technologies used current in the industry.

OBJECTIVES: To

i. Impart the state-of-art technology course existing in the industry.

ii. Expose students to application of technologies adopted by industry.

iii. Train students for solving real-world projects in respective industries by applying technical knowledge gleaned from an industry expert

iv. Make students draw benefit from the experience of veterans from industry. Knowledge sharing by industry experts.

v. Align student's mind-set towards industrial environment through the instructor from industry. Provide industry instructor lead courses.

CREDIT/HRS.:

Percentage of Industry Taught Courses in the programme =……………. %

METHODOLOGY:

A) A faculty shall be appointed as course co-ordinator. Roles and responsibilities of Course coordinator are as follows:

(i) Act as a liaison between identified Industry expert and department.

(ii) Arrange schedule of lectures in consultation with identified Industry expert.

(iii) Keep record of students' attendance.

(iv) Collect feedback from students and suggest changes and modifications in lecture delivery method by industry subject expert.

(v) Keep record of Unit Test Performance and Practicals along with experts.

(vi) Organise visit to the industry relevant to the course.

B) Execution:

(i) The Identified industry expert can conduct theory classes on weekends or as per convenience of Industry experts either through offline or online mode. The courses which are to be taught by expert from industry are already identified and confirmed in workshop-I

(ii) Practical sessions will be conducted by course coordinator. Panel of experts from Industry shall be identified to teach the course before the commencement of the respective semester and submitted for the approval of the Head of the Institution with financial layout.

BHARATI VIDYAPEETH

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COLLEGE OF ENGINEERING, PUNE – 411043.

Approval format for Expenditure for Industry Taught Course

Date:

Name of the Department: ______________________________

1. Budgetary allocation for industry expert (As per Budget 2021-22) Please mention total amount (in Rupees) and other bifurcations, if made---------------- (to be filled at college level)

2. No. of Lectures (Industry offered Course wise / Subject wise) required with specific subjects:

Sr.No.	Title of the course	Name of Department	Semester	Work Load per week	Details of Industry Expert(s)				Total Remuneration
					Name & Designation of Expert	Name of the company	Contact Details	Honorarium per lecture	
1									
2									
3									

Recommendation for Course Coordinator
Recommendation for HoD
Recommendation for Principal

3. Total financial Outlay for honorarium of Faculty: (Industry taught courses-Subject wise): with number of lectures (in Hours) in UG sections

Sr. No.	Name of industry Expert	Honorarium	Financial Outlay (in rupees)
1			
Total			

Signature of HoD **Signature of Principal**

Request format-To Industry Expert

To

……

Subject: Industry Taught Course (ITC) for B.Tech (…..) , Sem-____

Dear Sir,

Greetings from Dept. of _________, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune, BV(DU)COEP an AICTE approved institution, was established in the year 1983 and is a constituent unit of Bharati Vidyapeeth (Deemed to be University), accredited (3rd Cycle) with 'A+' grade by NAAC and NBA.

In the national arena, BV(DU)COE Pune has been among top 100 Engineering Colleges of India, consecutively for five years (99th ranking in 2020) by MHRD in June 2020. It has also been ranked 20th at national level by AICTE Internshala for internships. Our reputation as India's premier engineering institution is further enhanced by being honored with the Platinum category by AICTE-CII survey. College is proud to be ranked 11th across India by the prestigious magazine India Today. DATAQUEST a leading journal, ranked BV(DU)COEP in 3rd position amongst the Top 50 Private T - Institutes of India. The college ranked 17th position in the survey conducted by Times of India in 2019.

----Brief about dept-----

The course curriculum has a multi-dimensional approach, it not only implements a dynamic, qualitative, and evolved structure and syllabus, but also incorporates a good and healthy mix of theoretical and practical exposure. In this regards the institute promotes and encourages courses in line with industry expectations and forthcoming challenges which should ease the students for undergoing industry offered courses for practical exposure of applications of Education system. This is much required to bridge the gap between Industry and Academia and by promoting industry orientation for creating a complete industry ready professional.

To fulfil these objectives, curriculum design, which will be implemented from the academic year 2021-22, B.Tech. program includes 6 courses taught by industry experts. With reference to the subject mentioned above, we request you to teach… ….. Total…… number of lectures (60 min each) are required to be delivered. A blended learning, to be offered for the students through combining online or offline teaching wherever and whichever is best possible. Therefore, I request you to send acceptance letter, mode of teaching, convenient day and time slot to teach the said course. Enclosed please find herewith standard format for reply.

With Thanks and Regards,

Sign and stamp of Head, Dept of ________

Enclose:- Course content

Reply

To

The Principal

BV(DU)

COE,

Pune.

Subject: - Acceptance for delivering/ conducting lecture of the course -------- of B.Tech(-----), Sem(----).

Ref.: - Your letter ------------------ dated-

Dear Sir,

This has a reference of your letter mentioned above. It gives me immense pleasure to accept your invitation to deliver lectures in the said course. Following will be the time-table for the lecture.

Sr. No.	Title of Course	Time	Days						
			Mon	Tue	Wed	Thu	Fri	Sat	Sun

Sincerely

<Signature >

< Name of Expert>

BHARATI VIDYAPEETH
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COLLEGE OF ENGINEERING, PUNE – 411043.

Date:

AGREEMENT TIME-TABLE

Name of department:

Name of industry taught course:

Sr. No.	Day	Date	Time Slot

(Name & sign. of HOD with date & stamp) (Name & Sign. of Concerned Person)

Industry Taught Courses (Assessment- Theory/ Practical)

- One course coordinator should be appointed for the course. All documents related to assessment of the course will be maintained by the course coordinator.
- Total assessment of Industry Taught Course -Theory is of 100 Marks.
- Assessment of this course consists of Internal Assessment and End Semester Exam which carry 40 Marks and 60 Marks, respectively.
- Internal Assessment consists of assignments and mini projects.
- One real world project (mini project) is considered as part of Internal Assessment.
- Students should give presentation on given topic.
- Industry expert should set question papers.
- In case of practical exam, industry expert can take oral exam (may be online) and students will perform the experiments in the presence of course coordinator in the department.

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B.Tech (Brach Name) Sem __

Title of ITC: - _________

Record of Lecture Taken

Sr. No.	Lecture No.	Unit no.	Date of Conduction	Topic Covered	No. of Students Attended	Sign

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Bill format for remuneration for Industry Taught Courses

(The bill should be submitted directly to the concerned department on or before 5th of every month)

1. Name of industry expert: ______________________________
   Company/Industry name:
2. Name of the Department: ______________________________
3. Remuneration for the Month: ______________________________
4.

Name of the Bank	Branch	A/C No.	IFSC

5. Contact Details: -

Email	Cell Phone No.

6. Details of lectures delivered:

Sr. No.	Title of the Course	Class	Date	No. of lectures	Total Remuneration (Rs./lecture)
	Total				

Date: ______________

____

Signature of the Industry expert

Certified that   has been appointed by the -----
dept as an industry expert for the course vide order No. ______________________

dated. _______________________ has delivered ____ lectures/taken classes during the month/ Sem ____________________

and is entitled to honorarium of Rs. __________________(@Rs. ------ /- per lecture/per day)

Course Coordinator: _________________________

____

Signature of the Head of the Department with Seal

Date:

Receipt: -

Received with thanks ₹-------- from BVDUCOE, Pune towards conduct of -------- lectures of the course ------------- of B.Tech(-------), Sem--- --.

Signature of Industry Expert

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Payment Record
(Copy to be maintained in the Department)

Sr. No	Name of Department	Name of course	Name of Industry Expert	Name of company	Email	Mo. No	Address	Amount	Remark/ check number transaction id

Encl:
1) College voucher copy
2) NEFT/RTGS copy

5.5 MOOCs Implementation

To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Courses to all the students. It will provide an affordable and flexible way to learn new skills, advance the career and deliver quality educational experiences at scale.

Also, National Education Policy is insisting the Online and Digital Education and Ensuring Equitable Use of Technology.

A massive open online course (MOOC) is an online course aimed at large-scale interactive participation and open access via the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for the students, professors, and teaching assistants (TAs).

BV(DU)COE Pune is having active NPTEL local chapter-partnership. Proposed curriculum has introduced three MOOCs at B.Tech Sem – III, Sem V and Sem VII with following objectives.

1. To provide e-learning through online web and video courses in Engineering by experts in the country in that subject.
2. To develop self-learning attitude in students.
3. To provide platform for knowledge enhancement of student's as per their area of interest.
4. To update students with advanced technologies.
5. To make the students more employable.
6. To prepare the students for competitive exams like GATE and also for higher studies.

Methodology of Assessment:

- Department shall publish list of NPTEL courses in every semester. Student can refer selected one of them in respective semester.
- Considering pre-requisite, proposed curriculum has provided with the various subject baskets as per the courses available.
- Students need to enroll for the course in each academic year as mentioned in the structure.

- Students need to attend all online lectures and complete all assignments as per schedule for registered course.
- Student will register and appear for exam conducted by NPTEL and shall submit the copy of course completion certificate received after passing the exam for registered course.
- Accordingly, the credits will be allotted to the student for respective MOOCs.
- Students have the flexibility to attempt the said course during the entire B.Tech Programme to earn the credits of respective MOOCs.
- NPTEL courses relevant to respective branch are only expected to select by students. Credits will not be awarded if general/ non engineering courses opted.

5.6 Project I and II

Project Stage I Objectives:

Provide help to the students

- In generating a new idea or modify existing system for solving societal, industrial and/or institutional problem.
- In review of literature that aligns with new idea and/or existing systems and clearly defining the problem
- In developing a workflow process/methodology for the desired system.
- In designing various components of the system assembly
- In developing a CAD model of the desired system.
- In writing the technical report based on the work completed

Project Stage II Objectives:

Provide help to the students

- In fabrication of the experimental setup/new system and/or purchase of standard components
- In pilot run and/or validation of new system for its performance
- In modifying the system if required to improve its performance.
- In detailed parametric studies of the modified system and analyzing the results
- In writing the technical report, research article and/or filing a patent.

Particular	Hours per week	Credits allotted
Project I stage I	2	4
Project I stage II	2	4
Project II stage I	4	4
Project II stage II	4	6

Assessment & Evaluation:

For Project-I Stage I & II		
	Assessed through	Marks
Assessment Tools	Presentation 1	10
	Presentation 2	10
	Presentation 3	10
	Continuous Assessment by guide	10
	Final Project demonstration, presentation & viva voce (University Examination)	60
	Total Marks	**100**

For Project-II Stage I & II		
	Assessed through	Marks
Assessment Tools	Presentation 1	20
	Presentation 2	20
	Presentation 3	20
	Continuous Assessment by guide	20
	Final Project demonstration, presentation & viva voce (University Examination)	120
	Total marks	**200**

Minimum number of in-sem. project presentations: 03

Parameters for evaluation of project in University examination

1. Idea of Project/Topic
2. Technical content
3. Innovation
4. Experimentation/Model development/Software development/Simulation development etc.
5. Participation as an Individual
6. Research Potential
7. Project Hardware/Software
8. Fabrication/Model/Equipment development
9. Data Analysis
10. Attendance
11. Timely completion
12. Report writing
13. Presentation

Prepare a format for report card of indicating progress, assessment and progressive evaluation of the project. This progressive evaluation record (PER) is prerequisite for university examination.

Progressive Evaluation Record (PER) shall be submitted in the department at the end of the semester and made available at time of university examination.

Format for Internal Examination for Project- I & II
B.Tech (------), Sem--------

Roll No.	PRN	Name of student	Term Work Marks			
			Presentation-I (10%)	Presentation-II (10%)	Presentation-II (10%)	Continuous Assessment by Guide (10%)

Format for University Examination for Project- I & II

Roll No.	PRN	Name of student	Parameter for assessment of project and marks for examination													Total out of 100	Any five parameters out of remaining
			Idea of Project/Topic	Technical content	Innovation	Experimentation/Model development/Software development/Simulation development/Simulation ion development etc	Participation as an Individual	Research Potential	Project Hardware/Software	Fabrication/Model/Equipment development	Data Analysis	Attendance	Timely completion	Report writing	Presentation		
			10	10	10	10	10	10	10	10	10	10	10	10	10		

Out of 13 parameters, parameters no. 1,3,4,6 & 8 are mandatory and may be considered for assessment of the project. Each parameter will carry 10 marks for Project-I & 20 marks for Project-II.

5.7 Social Activities for the Learners

A) Introduction

The prime objective of Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune is holistic development of students. The learner achieves the status as "whole" when he/she has not only achieved success in academics but also has succeeded in bringing the nation up by connecting with socially left-out elements and bringing ray of hopes into their lives. In this respect, the new curriculum encourages the learner on the social activities. In this case, student's social activities are provided by the colleges, but not limited to them. Total of four credits assigned for these activities.

B) Objectives

a) To make people create balances, so they do not only focus on academic aspects, but there can also be other aspects to have in life.

b) To build better relationship with others.

c) To create great balance with the academic aspects.

d) To learn and understand society.

e) To develop the nature of help and enhance the ethical norms for behaviors.

f) Teamwork

C) Outcome of Social Activities:

The social activities make a good impact on learners. The learner:

a) Will be able to understand the needs of society.

It enables a learner to consider the perspective of other people and understand their needs by interacting with people from diverse backgrounds.

b) Will be able to understand different perspectives and engage other cultures.

Social events develop social skills and empathy—the outward-oriented dimensions of emotional intelligence (EQ). The interactions or conversations elicited by events helps students build relationships, understand different perspectives and engage other cultures. Social events provide an opportunity to expand one's social circle.

c) Will be able to maintain positive outlook towards life.

With high adaptability to diverse situations and a good level of understanding of other's opinions, socially aware learners are less likely to indulge in negative behavior. They are also less vulnerable to stressful situations and have fewer chances of getting involved in undisciplined behavior. These students also have a more positive outlook on life.

d) Will be able to maintain good emotional health.

Social activities keep the learners sharp and mentally engaged, and this is important to prevent the onset of serious diseases like dementia or Alzheimer. Connecting with others helps keep you in a positive mood, which in turn wards off depression by improving physical health and maintaining good emotional health as well.

D) Sample list of Social Activities (not limited to them)

a) Organizing Educational Camps

Educational camps may be organized for the socially and economically week elements, especially in rural areas or even in the slum areas of the city, by making them aware of the importance of education and their own human rights.

b) Tree Plantation Drive

There are so many health benefits to having plants around – like fresher air, improved emotional state, and reduction of illness in and around the society. Tree plantation in this respect plays a crucial role. Just planting the tree is not enough but it should be made to grow to its extent.

c) Offer Helping Hand for Martyrs Family by Fundraisers

Soldiers fight for our country, securing our borders. They don't think of their family and sacrifice their lives for us, and what we do for them? Packages are announced every time after the death of our worriers but rarely reaches them. Families keep waiting for years. In this regard, few of these forgotten families can be visited and a small helping hand can be lend to them, to make them lead their further life peacefully. Fundraising in this respect, is a great student society social idea. It is incredible to see how people can bring positive change if they work together. The youth can make a team with an external organization to take part in a purposeful community event as mentioned above.

d) National Service Scheme

It will help in the overall personality development of a learner by participating in projects that benefit the community. This extra-curricular activity is sponsored by the Ministry of Youth Affairs and Sports.

e) Felicitations of People who have contributed to the society but now forgotten by the society

There are so many intellectuals in our society who have achieved great heights in their field, who are stalwarts in different field but never came into limelight, their contribution is not recognized. Few of these can be invited publicly or visited at individual level by making a team and felicitate to appreciate their contribution towards the society or nation. Some of these stalwarts may be like Anand Kumar who teaches underprivileged students for IIT-JEE without a penny, Shekhar Naik who is the Captain of Indian Blind Cricket Team, Ranjeet Singh Desale who even being a rural teacher, is awarded by UNESCO with Global Teacher Prize, Ritu Biyani who fought cancer, traveled across the country to spread awareness.

f) Street Play on Social Awareness

This is also typically known as “Nukkad Natak”. This form has been used to propagate social and political messages and to create awareness amongst the people regarding social issues. What is important is that the plays make the people think. The play is seen by many people of different age groups who then question and discuss the contents of the play. There have been several plays exposing the mechanism of black marketing and hoarding. Some talk of the use of political power for pressurizing people. Others highlight caste conflicts or ideas about hygiene and health. Street plays are also used to encourage literacy amongst villagers. Street plays on some of the topics like degradation of Indian media, hypocrisy, responsibility towards environmental concerns, brain drain, dilapidated educational structure, safety issues and rights for women. child labor, organ/human trafficking etc., can be thought of. The learners can participate in street play festivals like Manthan Mahotsav, the largest street play festival in India.

g) Poster Exhibition on Contributions of Heroes of India

The learners can organize an exhibition to not only display but explain the contribution of Indian Heroes who have been forgotten and remained in the book of history. Some of these inspiring heroes may be Mihir Sen, Khashaba Dadasaheb Jadhav, Anandibai Joshi – First woman doctor from India, Bhikaji Cama, Khudiram Bose, Baba and Prakash Amte etc. Such exhibitions make inspired, the youth of today's generation.

h) Waste Clean Drive

i) Educating literacy-poor societies about disposal of nature-harming objects

j) Distributing needful items for living in economically backward societies

k) Organizing early completion on national issues.

l) Cleaning of Public Places/ Traffic Management/ Police Mitra.

m) Organizing activities under engagement of people with Science and Technology.

Report of social activities conducted each student shall be prepared in standard format. Appropriate documentary evidences shall be part of report of students correspondence with respective authorities for social activities, permissions, certificates from Institutes/Organization/Local Government are essential documents for award of credits under this head.

E) Summary

Thus the interactions or conversations elicited by such social events help students to build relationships, understand different perspectives and engage other cultures and these events not only will uplift the moral of the society but also ignite minds of generations ahead to provide their support and enthusiastically participate in such activities. Such interactions will certainly provide an opportunity to expand their own social circle.

5.8 Internship

Internship of 60 days is incorporated as an integrated part of curriculum structure-2021. The primary objective of internship is to make students familiar with industry environment and to take up on- site assignment as trainees or interns in order to bridge the gap between theory and industrial practices. It is mandatory for students to undergo in-plant training after completion of semester VI in reputed industrial organization. The student shall submit the “Intern Certificate” issued by the industry organization as well as a technical report not exceeding 30 pages within the stipulated time to be eligible for making a presentation before the committee constituted by the department. On the basis of daily work carried out in the industry, student shall prepare a record book. This record book shall be checked and signed by his/her supervisor from the industry where he/she is doing internship on daily basis.

University examination carries 50 marks and after successful completion, student may be awarded 3 credits for the internship work. Standard format for record book shall be as below. Marks will be awarded out of maximum 50 and three credits will be given upon completion of internship towards the degree requirements, as per the regulations. Internship will ultimately assist students to apply theory learned in classroom to industrial practices so as to understand engineering/technical solutions in a global, economic, environmental and societal context.

5.9 Research paper publication

Research paper publication is one of the innovative features of programme curriculum- 2021.

1. It has been & introduced in 7th semester. Two credits are awarded for the same subject to publish of research paper. Student shall publish a research paper in peer reviewed/ Standard journal(not in paid journals) based on research work carried out for Project-I. Guide for Project-I shall be responsible for Writing manuscript, Selection of journal for publication, Submission of manuscript to the journal. Progress report of publication of research paper shall be prepared in standard format and submitted for the award of credits. Students shall be first author of research papers. No name either of faculty members except guide or other students shall be added without any contribution in research/project work. Format for progress report of research paper published (To be maintained by Guide). A departmental committee comprising of head of department, project guide, and one senior professor will review the progress of this activity periodically (not exceeding three months). The suggestions/comments offered by committee will be incorporated in due course of time to accomplish the task within a predetermined period.

2. Research paper publication as a integrated part of the course structure, will inculcate research aptitude among students. This will help there in seeking admissions in reputed International Universities for higher studies. Further, this research aptitude developed may enhance his employability also.

3. This activity is expected to generate 15 to 20 publication per year, which will enhance research profile of department and institute too.

4. Hence, there should be team of maximum 3 to 4 students per project except very exceptional projects. Prior permission to increase team size is essential.

Weekly progress report of the research paper publication.

Title of the project -

Name of the Guide -

Weekly schedule of meeting- Day------- Time-----

Student Details - Name--------- PRN------ Roll No.---

Sr. No.	Week No.	Date	Work completed/done by students per week

Program: B. Tech. Civil **Sem: I** **CBCS2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Differential Calculus	4	-	1	60	40	-	-	-	100	4	-	1	5
2.		Applied Chemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
3.		Construction and Materials	4	2	-	60	40	25	25	-	150	4	1	-	5
4.		Civil Engineering Structures and Geology	4	2	-	60	40	25	-	25	150	4	1	-	5
5.		Introduction and Opportunities in Civil Engineering	3	-	-	60	40	-	-	-	100	3	-	-	3
6.		Graphics for Civil Engineers	-	2	-	--	--	25	25	-	50	-	1	-	1
7.		Workshop Technology	-	2	-	--	--	50	-	-	50	-	1	-	1
8.		Fundamentals of Problem Solving Logic (Using C)	-	2	-	--	--	25	-	-	25	-	1	-	1
	Total		**18**	**12**	**1**	**300**	**200**	**175**	**50**	**25**	**750**	**18**	**6**	**1**	**25**

Program: B. Tech. Civil **Sem: II** **CBCS2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Integral Calculus	4	-	1	60	40	-	-	-	100	4	-	1	5
2.		Acoustics and Modern Physics	3	2	-	60	40	25	-	-	125	3	1	-	4
3.		Statics and Dynamics	4	2	-	60	40	25	-	-	125	4	1	-	5
4.		Basic Land Surveying	4	2	-	60	40	25	-	50	175	4	1	-	5
5.		Construction Design and Drawing*	3	2	-	60	40	25	25	-	150	3	1	-	4
6.		Civil Engineering Software – I (AutoCAD)	-	2	-	-	-	25	-	25	50	-	1	-	1
7.		Object Oriented Programming (Using C++)	-	2	-	-	-	25	-	-	25	-	1	-	1
	Total		**18**	**12**	**1**	**300**	**200**	**150**	**25**	**75**	**750**	**18**	**6**	**1**	**25**

***Theory paper of 4 hours duration**

Programme: B. Tech. (Civil) Sem – I (2021)

<table>
<tr><td colspan="6">Course: Differential Calculus</td></tr>
<tr><td colspan="3"><u>TEACHING SCHEME:</u></td><td colspan="2"><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS</u> ALLOTTED:</td></tr>
<tr><td colspan="3">Theory: 4 Hours / Week</td><td colspan="2">End Semester Examination: 60 Marks
Internal Assessment: 40 Marks</td><td>Theory: -04</td></tr>
<tr><td colspan="3">Tutorial: 1 Hour / Week</td><td colspan="2"></td><td>Tutorial: - 01</td></tr>
<tr><td colspan="6"></td></tr>
<tr><td colspan="6">Course Pre-requisites: The students should have knowledge of</td></tr>
<tr><td>1</td><td colspan="5">Algebra of matrices and its Determinants, Maxima and Minima of single variable functions.</td></tr>
<tr><td colspan="6">Course Objectives:</td></tr>
<tr><td>To study</td><td colspan="5">1. Fundamental theorems, concepts in Matrices, Demoivr's theorem and its applications in engineering.
2. Various techniques in Calculus, Explanation of functions and Infinite series.
3. Partial differentiation, maxima, minima and its applications in engineering.</td></tr>
<tr><td colspan="6">Course Outcomes: The student will be able to</td></tr>
<tr><td>1</td><td colspan="5">Understand rank of matrix and apply it to solve system of linear equations</td></tr>
<tr><td>2</td><td colspan="5">Understand the DeMoiver’s theorem, hyperbolic functions and apply it in engineering problems.</td></tr>
<tr><td>3</td><td colspan="5">Understand the Leibnitz’s rule and apply it to find nth derivative of a function.</td></tr>
<tr><td>4</td><td colspan="5">Understand fundamental concepts of convergence, divergence of infinite series and its tests.</td></tr>
<tr><td>5</td><td colspan="5">Understand the concept of partial differentiation and apply it to find total derivative.</td></tr>
<tr><td>6</td><td colspan="5">Evaluate the maxima and minima of any two variables functions.</td></tr>
<tr><td colspan="6">Course Content:</td></tr>
<tr><td colspan="2">UNIT - I</td><td colspan="3">Matrices:
Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors.</td><td>(08 Hrs)</td></tr>
<tr><td colspan="2">UNIT - II</td><td colspan="3">Complex Numbers and Applications:
Definition, Cartesian, Polar and Exponential Forms, Argand’s Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.</td><td>(08 Hrs)</td></tr>
<tr><td colspan="2">UNIT - III</td><td colspan="3">Differential Calculus:
Differential Calculus: Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.
Expansion of Functions: Taylor's Series and Maclaurin's Series.</td><td>(08 Hrs)</td></tr>
<tr><td colspan="2">UNIT - IV</td><td colspan="3">Differential Calculus: Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.
Infinite Series: Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute
and Conditional Convergence, Power series, Range of Convergence.</td><td>(08 Hrs)</td></tr>
</table>

UNIT - V	**Partial Differentiation and Applications:** Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables	**(08 Hrs)**
UNIT - VI	**Jacobian:** Jacobians and their applications, Chain Rule, Functional Dependence. **Maxima and Minima:** Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	**(08 Hrs)**
Internal Assessment		
	Unit Test: I and II	

Textbooks:

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, (Pune Vidyarthi Griha Prakashan, Pune), 7th Edition, 1988,Reprint 2010.
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi),42th Edition, 2012.

Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill), Edition ,2008.
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8th Edition, 1999, Reprint 2010.
3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning), Edition 2007
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2nd, Edition, 2002.

Project Based learning topics for Differential Calculus:

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.

1. Echelon form
2. Normal form
3. Linear and orthogonal transformation
4. Eigen values and eigen vectors
5. Argand diagram
6. De Movre’s theorem
7. Hyperbolic and logarithmic functions
8. Leibnitz theorem
9. Taylor’s theorem
10. L’Hospital rule
11. Tests for convergence
12. Euler theorem for homogeneous functions
13. Total derivative
14. Maxima and minima for two variable function
15. Langrage undetermined multipliers

Syllabus

Programme: B. Tech. Civil Sem - I Course (2021)

Course: Applied Chemistry		
TEACHING SCHEME: Theory: 03 Hours/Week	**EXAMINATION SCHEME:** Semester End Examination: 60Marks Internal Assessment: 40Marks	**CREDITS:** Theory :03
Practical: 02 Hours / Week	Term Work: 25 Marks	Term Work: 01

Course Pre-requisites: The students should have knowledge of	
1	Corrosion**,** water and wastewater
2	air pollution and air polluting parameters
3	properties of cement, fuel cell, solar cell and alloys
Course Objective:	
	The student should be able to determine properties of water, cement and metal.
Course Outcomes: The student will be able to	
1	Apply their knowledge for protection of different metals from corrosion.
2	Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
3	Identify the sources of air pollution and its implications on the environment.
4	To learn fundamentals of energy storage systems such as battery, solar cell
5	Outline the importance of testing of cement and its properties and applications.
6	To understand and analyze the necessity of making an alloy and its applications in various industries.

Course Content:		
Unit - I	**Corrosion And Corrosion Protective Treatments**: Introduction, Definition, Types of corrosion, Mechanism of wet corrosion, Protection of Corrosion like, Metallic coatings, Electroplating, Methods of cleaning articles before electrode position, Electroplating methods, Electro less plating, Some electro less plating's, Some other metallic, coatings, Chemical conversion coatings, Organic Coatings, Paints, Varnishes, Enamels, Special paints.	(06-Hrs)
Unit - II	**Water And Waste Water Chemistry** Introduction, Hardness of water, characteristics imparted by impurities, Analysis of contaminants, Treatment of Water by Zeolite, L-S process, Boiler feed water, Wastewater treatment. Green Chemistry: Definition, Twelve principles of Green Chemistry.	(06-Hrs)
Unit - III	**Air Pollution And its Analysis** : Pollutants and their sources, pollution by SO_2, CO_2, CO, NOx, H_2S and other foul-smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Green House effect and Global warming, Ozone	(06-Hrs)

	depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates. Acid Rain, Green house effects, Depletion of Ozone	
Unit - IV	**Industrial Practice:** Energy Storage Device : Solar cell, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Ni-Mn Batteries, Li-Ion Batteries, Lead – Acid Batteries.	(06-Hrs)
Unit - V	**Cement** : Definition, Classification and properties - Natural, Pozzolana & Port land Chemical constituent of Portland cement. Manufacture of Portland cement by wet process. Manufacture of Portland cement by dry process (using flow sheet diagram)Setting& Hardening of Portland cement with chemical reaction. Heat of hydration of cement. Properties and applications of Portland cement, Nano cement Chemical Reactions of Portland Cement, Cement/Water Reaction, Carbonation Reactions, Hydration Reaction Mechanism, Hydration Reaction on Aluminates, Fly ash reaction.	(06-Hrs)
Unit - VI	A**lloys** :Introduction, Necessity (Purpose) of making alloys, Classification of alloys. Preparation of alloys – Fusion method, Electro deposition method, Composition, Properties & Application of following - (i) Brass (ii) Bronze (iii) Duralumin (iv) Nichrome (v) Steel – Mild, Medium & High.	(06-Hrs)

Term Work: (Experiments)	
1	Determination of dissolved oxygen in water.
2	Determination of hardness of a given water sample by using EDTA
3	Measurement of chloride, sulphate and salinity of water samples by Simple titration method. ($AgNO_3$ and potassium chromate)
4	Determination of Ca from cement
5	To determine the strength of given acid using pH titrations.
6	Determination of Biochemical Oxygen Demand (BOD)
7	Study of corrosion of metals in medium of different pH.
8	To learn the specific charge/discharge characteristics of a Lithium- ion (Li- ion) battery through experimental testing of a remote triggered Li- ion Battery.
9	To Prepare Phenol formaldehyde/Urea formaldehyde resin.
10	To study set up of Daniel Cell
11	Determination of Biological Oxygen Demand (BOD)
12	To determine pH of soil
13	To determine Acidity of soil
14	To Study Lead – Acid Battery
15	Preparation of borax/ boric acid.
Assignments:	
Six assignments to be given by the subject teacher (Theory)-one from each unit	

Reference Books:
1.A Text Book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co, 2004
2.Engineering Chemistry (16th Edition) Jain& Jain, Dhanpat Rai Publishing Company, 2013.
3.Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1992.
4.Bhal&Tuli, Text book of Physical Chemistry (1995), S. Chand & Company, New Delhi.
5.O. G. Palanna , Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.
6.S. S. Dara, A textbook of Engineering Chemistry, McGraw-Hill Publication, New Delhi.
7.Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi.
8.Shikha Agarwal, Engineering Chemistry- Fundamentals and applications, Cambridge Publishers - 2015.
9.WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
Syllabus for Unit Test:
Unit Test -1 :UNIT – I to III
Unit Test -2 :UNIT – IV to VI
Topics for project based Learning for Applied Chemistry
1. Powder Coating methods used for prevention of metals from corrosion
2. Metallic Coating methods used for prevention of metals from corrosion
3. Analysis of various water contaminants
4. Treatment of water by Zeolite method.
5. To find various sources of air pollutants and its analysis.
6. Methods of estimation of CO, NOx
7. Construction and Working of - Acid and Alkaline Storage Battery
8. Construction and Working of Dry Cell, Ni-Cd Batteries
9. Manufacturing of Portland Cement.
10. To study the properties and applications of Portland cement.
11. Preparation of alloys – Fusion method, Electro deposition method.
12. To study Composition, Properties & Application of (i) Brass (ii) Bronze (iii)Duralumin
13. To study manufacturing of mild steel.
14. To analyze waste water .
15. To determine hardness of water and its ill effects.

Programme: B. Tech. (Civil) Sem – I (2021)

Course: Construction and Materials		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 4 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 4
Practical: 2 Hours / Week	Term Work: 25 Marks Oral: 25 Marks	Practical: 1
		Total:5

Course Pre-requisites: The students should have knowledge of		
1	Basic concepts of Engineering Drawing	
Course Objectives:		
	To develop the knowledge of building components, materials and construction practices	
Course Outcomes: The student will be able to		
1	Elaborate the types of structures and components of building	
2	Explain building foundation, types of masonry	
3	Identify the types of doors, windows and design various staircases	
4	Select and apply the proper type of floors and types of roofs	
5	Illustrate the types of plasters, pointing and paints	
6	Apply the proper formwork and scaffolding, use proper construction safety	
Course Content:		
UNIT - I	**Civil Engineering materials and Building Components** Civil Engineering scope, Types of Building as per National Building Code and role of Civil engineer; Types of structures based on loading, material and configuration (all types of construction materials); Building components and their functions	**(08 Hours)**
UNIT - II	**Building Foundation, Masonry and Material** Foundation: Types – Shallow foundation and Deep foundation, Suitability of foundations, failure of foundation and its causes. Stones and Stone Masonry: Requirement of good building stones, Stone masonry-principal terms, types (Random Rubble, Uncoursed Rubble, Coursed Rubble and Ashlar Masonry) Brickwork and Brick masonry: Characteristics of Bricks, IS Specification of Bricks, Classifications of bricks (Silica, refractory, fire and Fly ash bricks), Types of bonds: English, Flemish, Header, Stretcher.	**(08 Hours)**
UNIT - III	**Doors, Windows and Staircase** Doors: Definition and terminology, Installation of doors frames, Types of Doors: Glazed or sash door, flush door, louvered door, collapsible doors, revolving doors, sliding doors, swing doors. Windows: Definition and terminology, Types of window: Casement window, Sliding Window, Louvered or venetian window, gable window, skylight window, Ventilators. Stairs: Classification, Terminology used, Types: Straight staircase, Open well stair, quarter turn stairs, half turn stairs, turning staircase, dog legged	**(08 Hours)**

	staircase, circular stairs, Bifurcated stairs and spiral stairs, Details of Ramps, Lifts and Escalators. Lintels: Types, Details of R.C.C. lintels and chajja.	
UNIT - IV	**Floors and Roofs** Flooring: I.S. Specifications, Types of floor finishes and suitability, Construction details of (mud, concrete, brick and stone flooring), Factors for selection of flooring, types of flooring: Timber flooring, tiled flooring, ceramic flooring, mosaic flooring, Industrial flooring: tremix or Vacuum Dewatered Flooring (VDF) Roofs: Types, Suitability, Roof structures, Selection of roof covering material, Methods of water proofing of roofs, Types of trusses, Fixtures & fastenings.	**(08 Hours)**
UNIT - V	**Building Finishes** Plastering: Methods, tools used, Mortars, Defects, Plaster types: Lime plaster, cement plaster, gypsum plaster, Plaster of Paris and applications Pointing: Purpose and Types of pointing, Methods of pointing. Paints: Types and applications, Textures, Apex, Plastic emulsion Wall cladding: Materials, method of fixing, wall papering and glazing work.	**(08 Hours)**
UNIT - VI	**Formwork, Scaffolding and Safety in construction** Formwork: Necessity, Materials, Factors for selection, Types Scaffolding: Necessity, Materials, Factors for selection Safety in Construction: safety on site, storage of materials, construction safety, prevention of accidents, fire proof construction, repairs and maintenance.	**(08 Hours)**
Internal Assessment:		
Part- A	UNIT TEST- I :- UNIT – I, II, III	
	UNIT TEST II :- UNIT- IV,V,VI	
Part- B	**Assignments:** Students should perform theoretical / experimental assignment/s from the list below	
	1) Types of structures and building components	
	2) Building foundations, Stone and Brick Masonry	
	3) Design of staircase.	
	4) Floors and roofs	
	5) Building finishes	
	6) Formwork, scaffolding and Safety in construction	
Term Work:		
Part- A	The term-work shall consist of minimum **Five** drawing sheets from list below.	
	1) Lettering, Symbols, Types of line and dimensioning	
	2) Foundation: Isolated, Combined footings, Under Reamed Piles, Rafts	
	3) Type of stone masonry: Elevation and Sectional Drawing	
	4) Types of Brick Masonry:	
	5) Types of Doors and windows:	
	6) Types of stairs: plan and sectional drawing	
	7) Trusses: Various types of Trusses	

	8) Site Visit: To understand Various building Material and their use.	

Text Books:

1. "Building Construction"-Rangwala,Charotar Publication
2. "The Text Book of Building Construction"-S.P.Arora&S.P.Bindra-DhanpatRai Publication
3. "Building Technology and Valuation"- TTTI Madras, -- Tata McGraw Hill Publication
4. "Building Construction" by B.C.Punmia, Laxmi Publications.

Reference Books:

1. "My Construction Practices" R.B.Chaphalkar
2. "A to Z" Building Construction" Mantri Publications
3. "Materials of Construction" – Ghose- Tata McGraw Hill Publications
4. "Civil engineering Material'- TTTI Chandigarh- Tata McGraw Hill Publications
5. 'Building Material Technology by Ruth T. Brantly& L Reed Brantley, Tata McGraw Hill
6. Building Materials by S.K.Duggal, New Age International Publishers.

e-Resources

1. https://nptel.ac.in/course.html
2. https://theconstructor.org/write-for-us/
3. https://www.engineerwing.com/2012/10/tremix-flooring.html
4. http://home.iitk.ac.in/~mohite/composite_introduction.pdf

Topics for Project based learning:

1: Model making on various components of buildings, report writing, cost analysis and site visit.
2. Market survey, sample collections and report writing on all types of construction materials.
3. Report on Scope of Civil Engineering in various fields.
4. Collecting various National Building codes and report writing.
5. Model making on Types of Shallow foundations report writing
6. Model making on Types of Deep foundations report writing
7. Sample collections of various types of stones used in stone masonry report writing
8. Model making on Different types of stone masonry (mentioned in syllabus) report writing
9. Model making on various types of Brick bond masonry. (Mentioned in syllabus) report writing
10. Model making on different types of Doors report writing
11. Model making on different types of windows reports writing
12. Model making on different types of staircase report writing
13. Market survey, sample collections and report writing on various roofing materials.
14. The rain roof water-harvesting systems.
15. Site visit, market survey, report writing and cost analysis of various plastering materials.
16. Site visit, market survey, report writing and cost analysis of various types of Paint.
17. Model making on Types of formwork and designs.
18. Model making on various types of Scaffolding and designs.
19. Corrosion mechanism, prevention, and repairs measures of RCC structure.
20 Construction Project Management & Building Information Modelling

Syllabus

Programme: B.Tech Civil Sem - I (2021)

Course: Civil Engineering Structures and Geology		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 4 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory:- 4
Practical: 2 Hours / Week	Term Work: 25 Marks Practical: 25 Marks	Practical: 1
		Total: 5

Course Pre-requisites: The students should have knowledge of	
1	Basic engineering sciences.
Course Objectives:	
	To make the student know the variety of Civil Engineering Structures and the importance of Geology for Civil Engineers.
Course Outcomes: The student will be able to	
1	Identify and know various civil engineering structures based on their function.
2	Identify and know various civil engineering structures based on their behaviour.
3	Identify and know various civil engineering structures based on their performance
4	Students should be able to identify different rocks & minerals.
5	Students should be able to identify different Geological structures to decide location and type of civil engineering structure.
6	Students should be able to carry out preliminary geological investigation for Tunnel, Dam & Bridge.

Course Content:

UNIT - I	**Structures Based on their Function**: Types of structures, various functions served by Civil Engineering structures, Structures used for residential purpose, structures used for water storage and retaining, structures used for industries, structures used for transportation, structures used for treatment of water and wastewater, structures used for storage of liquids, special structures like nuclear reactors, towers, chimneys etc..	**(08 Hours)**
UNIT - II	**Structures based on their behaviour:** Various behaviours of a structure, Load bearing Structures, Framed Structures, light structures, medium structures, heavy structures, solid structures, tubular structures, cavity walls, shear walls, tall structures, flat slabs, precast and pre-stressed structures.	**(08 Hours)**
UNIT - III	**Structures based on their performance**: Various performances of a structure-strength, serviceability, Energy conservation, soil conservation from a structure, water conservation from a structure.	**(08 Hours)**

	Concept of ECO building, green buildings, Intelligent building, Low-Cost Housing, High rise buildings.	
UNIT - IV	**Importance of Geology in Civil Engineering structures.** Importance of Geology in Civil Engineering structures Mineralogy and Petrology: Mineralogy: Formation Process of Minerals, types of minerals, classification of minerals. Petrology: Igneous rocks-mineral composition, texture, classification of igneous rock. Secondary rocks- Weathering, texture & structure of sedimentary rocks & its classification. Metamorphic Rocks-Agents & types of metamorphism, building stones.	**(08 Hours)**
UNIT - V	**Structural Geology & Indian Geology**: Structural Geology- Outcrop, dip & strike, conformable series, unconformity & overlap, faults & folds in rocks, mode of occurrence of igneous rocks, joints & fractures. Indian Geology- General Principles of stratigraphy, age of the earth & divisions of geological time, physiographic divisions of India & their characteristics, geological history of peninsula, study of formations in peninsula.	**(08 Hours)**
UNIT - VI	**Geological Investigations:** Preliminary geological investigations surface survey, use of geological maps &sections, subsurface investigation. drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts etc. Limitation of drilling, engineering significance of geological structures.	**(08 Hours)**
Internal Assessment:		
Part- A	UNIT TEST – I and II	
Part- B	**Assignments:** Students should perform theoretical / experimental assignment/s from the list below	
	1) Types of structures and their functions.	
	2) Structures based on behavior	
	3) Structures based on performance	
	4) Types of minerals & Their physical properties	
	5) Types of different geological structures	
	6) Preliminary geological investigation.	
Term Work:		
	a) Review project on any one type of structures	
	b) Identification of the Minerals (2 Practical)	
	c) Identification of Igneous rocks (1 Practical)	
	d) Identification of Secondary rocks (1 Practical)	
	e) Identification of Metamorphic rocks (1 Practical)	
	f) Study of Contoured Geological Maps & drawing the sections (Six Practical)	
	g) Visit to site for understanding the geological features.	
Textbooks:		
1. S.P. Bindra S.P. Arora, "Building Construction", Laxmi Publication		

2. M. L. Shah, C. M. Kale, S. Y. Patki, “Building Drawing with integrated approach to Built Environment”, Tata McGraw Hill Publishers
3. Gupte R.B, “A text book of engineering geology”,P.V.G. Publications,Pune.
Reference Books:
1. IS provisions “National Building Code”
2. “Development Control Rules” of local plan sanctioning authority
3. Calendar, “Time Saver Standards for Architectural Design”, Tata McGraw Hill Publishers
4. Merit, “Building Design and Construction”, Tata McGraw Hill Publishers
5. Engineering Geology & General Geology By Parbin singh
6. General Geology & Engineering Geology by Dr.P.T.Sawant, New Delhi Publication.
Topics for project-based Learning for Civil Engineering Structures and Geology
1. Prepare a chart for structures used for Water treatment and sewage treatment plant.
2. Collect the information of various types of structures.
3. Prepare a model or chart for a retaining wall or any hydraulic structures.
4. Prepare a chart for comparison of load bearing and framed structure.
5. Prepare a prototype model for load bearing structure with showing all components.
6. Prepare a chart for various types of soil and water conservation structures.
7. Prepare a model of Bridge structure.
8. Collect the information of high rise building in India and prepare the report.
9. Prepare a chart or prototype model for Eco friendly and Intelligent building.
10. Effect of solid waste on quality of ground water.
11. Geophysical investigation using seismic refraction method to determine causes of real failure.
12. Resistivity methods used in horizontal and vertical discontinuities in the electrical properties of the Ground water.
13. Structural interpretation and mineral potential using remote sensing data and GIS tools.
14. Application of electrical resistivity method in ground water exploration.
15. Types of minerals.
16. Types of igneous rocks.
17. Types of metamorphic rocks.
18. Types of secondary rocks.
19. Texture of rocks.
20. Folds in rocks.
21. Failure in rocks.
22. Structures in rocks.
23. Determination of rock parameters, specific gravity, density and compressive strength of different types of rocks.

Syllabus

Programme: B. Tech. (Civil) – Sem – I CBCS 2021 Course

Course: Introduction and Opportunities in Civil Engineering

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED: 3**
Theory: 3Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory:3

Course Pre-requisites: The students should have knowledge of	
1	Basic Science
Course Objectives:	
	To develop the knowledge of Basics of Civil Engineering and Building construction.
Course Outcomes: The student will be able to	
1	Explain the introduction to civil engineering and various discipline.
2	Elaborate Scope and role of civil engineering in all sectors.
3	Identify the Civil Engineering project and process.
4	Select the approvals required for Civil Engineering Construction Projects**.**
5	Illustrate the Recent Developments in Civil Engineering
6	Apply the Opportunities in Civil Engineering

Course Content:

UNIT - I	**Introduction to Civil Engineering:** Introduction to History of Civil Engineering, Definition of Civil Engineering, Various branches of civil Engineering and its application : Structural engineering , Construction engineering , Surveying and mapping engineering, Transportation engineering r, Environmental engineering, Hydraulic and irrigation engineering, Geotechnical engineering, Estimation and coasting ,Project management, Link of Civil Engineering with various discipline of Engineering : Mechanical Engineering, Electrical Engineering, Chemical Engineering, Electronic and Entc, Computer Engineering.	**(06 Hours)**
UNIT - II	**Scope and role of Civil engineering:** Impact of infrastructural development on the economy of a country, Role of civil engineers, Importance of planning, Scope of Civil engineering in government sector, Scope of civil engineering in private sector, Role of civil engineering in society	**(06 Hours)**
UNIT - III	**Civil Engineering Project and Process:** Need of project, Estimation cost and benefits of project, Cost-benefit ratio, Conceptual approval, technical planning and project proposal, Administrative approval, Detailed project report, Detailed Estimate of cost, Approvals and NOCs, Tendering and contracts, Terms and conditions, Work allotment, Inspection and quality control, Completion, maintenance, Peoples and organizations involved, Role and responsibility of them, (Owner, Engineers, Architects, Contractor, Consultant, Govt departments)	**(06 Hours)**
UNIT - IV	**Approvals required for Civil Engineering Construction Projects:** Introduction, Different approvals required for Civil Engineering construction projects, different stages of the projects and approval required at every stage, Authorities for giving approvals, Necessity & Importance of approval, the	**(06 Hours)**

	procedure for approvals	
UNIT - V	**Recent Developments in Civil Engineering** Introduction to Automation and mechanization in construction industry – Advantages and Disadvantages, Use of Precast and Pre-Fabrication in Civil Engineering Industry, Concept and Elements of SMART cities, Intelligent buildings, concept of low-cost housing, erection techniques of temporary structures.	**(06 Hours)**
UNIT - VI	**Opportunities in Civil Engineering** Introduction, Types of career roles for Civil Engineers, Certifications for Civil Engineering, Required Skill set for Civil Engineering, Employment Opportunities for Civil Engineers, Career path for Civil Engineers- Government sector, Public sector companies and Own start-ups.	**(06 Hours)**

Text Book:		
1	"Building Construction"-Rangwala,Charotar Publication	
2	"The Text Book of Building Construction"-S.P.Arora&S.P.Bindra-DhanpatRai Publication	
3	"Building Technology and Valuation"- TTTI Madras,Tata McGraw Hill Publication	
4	"Building Construction" by B.C.Punmia, Laxmi Publications.	
Reference Books:		
1	"My Construction Practices "R.B.Chaphalkar	
2	"A to Z" Building Construction" Mantri Publications	
3	IS provisions "National Building Code"	
4	"Development Control Rules" of local plan sanctioning authority	
5	Calendar, "Time Saver Standards for Architectural Design", Tata McGraw Hill Publishers	
6	Merit, "Building Design and Construction", Tata McGraw Hill Publishers	
Syllabus For:		
Unit Test-I	UNIT – I, II, III	
Unit Test-II	UNIT- IV,V,VI	
List of Projects:		
Unit: I	**Introduction to Civil Engineering**	
1	1.Collection of Structural Information Historical structure of India: Visit, take photos, brows information and prepare report /chart	
2	Give day to day examples of Link of Civil Engineering with various discipline of Engineering: Photos in their day-to-day life they see about link of civil engineering with other discipline and write note in their own words on example they have seen (Minimum one example of link with each discipline)	
3	branches of Civil Engineer - Structural engineering, Construction engineering, Surveying and mapping engineering, Transportation engineering r, Environmental engineering, Hydraulic and irrigation engineering, Geotechnical engineering, Estimation and coasting, Project management: collect information on the branch of civil engineer of their choice and submit power point presentation	

Unit: II	**Scope and role of Civil engineering**	
4	Infrastructural development: Collect information on infrastructural development of country in last 6 years and prepare booklet on it	
5	Scope of Civil engineering in government sector: collect information on jobs in government sector, selection criteria process and exams for selection. Make a poster and display on notice board of department	
6	Scope of civil engineering in private sector and Role of civil engineering in society: collect information on jobs in private sector, make a poster and display on notice board of department	
Unit: III	**Civil Engineering Project and Process**	
7	Visit and take a interview of Civil Engineers, Architects, Contractor, Consultant, Govt departments and write your own observations of their work and share in for of class	
Unit: IV	**Approvals required for Civil Engineering Construction Projects**	
8	Different approvals required for Civil Engineering construction projects: make list of approvals requires brows the information about the process and prepare leaflet (Hard Copy)	
9	Authorities for giving approvals: visit any one approval authority of your place and prepare digital chart and mail to all staff and students of Department and take feed back	
10	Necessity & Importance of approval, the procedure for approvals: Prepare digital leaflet of necessity & importance of approval, the procedure for approvals and mail it to students and take feed back	
Unit: V	**Recent Developments in Civil Engineering**	
11	Present your ideas on low coast housing: Students have to build model of low coast house and need to explain its importance	
12	Present your ideas on Intelligent building: Students have to build model and explain concept.	
13	Present your ideas on Eco-Friendly building: Students have to build model and explain concept	
Unit: VI	**Opportunities in Civil Engineering**	
14	PPT on Required Skill set for Civil Engineering	
15	Own start-ups : Present idea of own start-up in front of class	
16	Software in civil engineering and its importance: collect information, download any one free software related to civil engineering and present its working in front of class	
17	Study the building structure where you live and write your observation along with photograph	
18	Study the traffic, traffic signals, parking on your way to college write your observation along with photograph	
19	Study Plumbing system of your house write your observation along with photograph	
20	Write a report on waste management in your house with photograph, discuss with your parents and improve waste management of your house.	

Syllabus

Programme: B.Tech Civil Sem - I (2021)

Course: GRAPHICS FOR CIVIL ENGINEERING

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Practical: 2 Hours / Week	Term Work: 25 Marks Oral : 25 Marks	Practical: 01
		Total: 1

Course Pre-requisites: The students should have knowledge of	
1	Basics of Mathematics at Secondary School Level.
Course Objectives:	
	To provide knowledge about
	• Fundamentals of engineering drawing and curves
	• Isometric views and projection
	• Projections of points, lines, planes & solids
	• Use of CAD tools.
Course Outcomes: The student will be able to	
1	Understand dimensioning methods and drawing of engineering curves.
2	Draw orthographic projections using 1st angle method of projection*.
3	Draw Isometric views from given orthographic projections*.
4	Draw projection of Lines, its traces and projections of planes*.
5	Draw projection of different solids*.
6	Draw development of lateral surfaces of solids*.
	*Using CAD tools

Course Content:

UNIT - I	**Lines and Dimensioning in Engineering Drawing and Engineering Curves** Different types of lines used in drawing practice, Dimensioning–linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Ellipse by Arcs of Circles method, Concentric circles method. Involutes of a circle, Cycloid. Introduction to Auto CAD commands.	**(04 Hours)**
UNIT - II	**Orthographic Projections** Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection	**(04 Hours)**

	method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections. (Using AutoCAD commands).	
UNIT - III	**Isometric Projections** Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view. (Using AutoCAD commands)	**(04 Hours)**
UNIT - IV	**Projections of Points & Lines** Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only). (Using AutoCAD commands)	**(04 Hours)**
UNIT - V	**Projections of Planes** Projections of Planes, Inclination of the plane with HP, VP. (Using AutoCAD commands)	**(04 Hours)**
UNIT - VI	**Projections of Solids** Projection of prism, pyramid, cone and cylinder by rotation method. (Using AutoCAD commands)	**(04 Hours)**
Term Work:		
	All sheets should complete using AutoCAD.	
	1 . Types of Lines, Dimensioning practice, free hand lettering, 1^{nd}and3^{rd}anglemethodssymbol.	
	2 . Engineering Curves	
	3 . Orthographic Projections	
	4 . Isometric Views	
	5 . Projections of Points and Lines	
	6 . Projections of Planes	
	7 . Projections of Solids	

Text Books / Reference Books:
1. “Elementary Engineering Drawing”, N. D. Bhatt, Charotar Publishing house, Anand India,
2. “AutoCAD 2020 Beginning and Intermediate”, Munir Hamad, Mercury Learning & Information Publication, 2019.
3. “Engineering Drawing and Graphics”, Venugopal K., New Age International publishers.
Reference Books
1. “Text Book on Engineering Drawing”, K. L. Narayana & P. Kannaiah, Scitech Publications, Chennai.
2. “Fundamentals of Engineering Drawing”, Warren J. Luzzader, Prentice Hall of India, New Delhi,
3. "Engineering Drawing", M. B. Shah and B.C. Rana, 1^{st} Ed, Pearson Education, 2005
4. "Engineering Drawing", P. J. Shah, C. Jamnadas and Co., 1^{st} Edition,1988
5. " Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10^{th} Edition, S. K. Katariaand Sons, 2005

Syllabus

Programme: B.Tech Civil Sem - I (2021)

WORKSHOP TECHNOLOGY			
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory: - 00 Hours/ Week	End Semester Examination	-------	Theory: 00
Practical: -02 Hours/ Week	IA	--------	
	Term Work	50 Marks	Term Work: 01
	Total	50 Marks	01

Course Pre-requisites: -	Students should have basic knowledge of hand tools used in day to day life.

Course Objectives:

The Student should

1. To acquire the knowledge of basic manufacturing processes.
2. To identify tools, work material and measuring instruments useful for sheet metal, welding, carpentry, plumbing and Piping practice.

Course Outcomes:

The students should be able to

1.	**Understand** the basic Manufacturing Processes used in the industry.
2.	**Understand** various tools and **apply** suitable tools for suitable operations in civil work.
3.	**Understand** the importance of safety.

Term work shall consist of any three jobs and demonstrations on rest of the trades, journal consisting of five assignments one on each of the following topics.

Plumbing and Pipe fitting Shop: Study of Pipe joints, Pipe fitting, Cutting, Threading and Laying of pipes. Different tools and equipment like pipe vice, pipe bending machine, dies and die holder, plumbing vice, cutting dies, pipe wrench, ball peen hammer etc. are used for plumbing operations on G.I. pipe.

Welding Shop: Electric arc welding, Study of tools and Operations, Edge preparations, Types of welding joints, Exercises making of various joints. safety practices and general guidelines.

Joining methods: Study of tools and Operations of **riveting**, Fabrication of toolbox, tray, electrical panel box etc. and study of bolts. joints by bolting etc.

Carpentry Shop: Introduction to wood working, Study of tools and Operations and carpentry joints, Simple exercise using jack plain. To prepare half lap corner joint, mortise and Tennon joints, Simple exercise on woodworking lathe. Safety practices and general guidelines.

Plastic Molding shop: Introduction to plastic molding. types of plastics. types of plastic molding. Exercise on plastic molding machine.
Text Books/ Reference Books
• O.P.Khanna , A Text Book of Welding Technilogy, Dhanpat Rai and Sons
• P.N.Rao , Manufacturing Technology- Vol I, mCgRAW Hill Education 9 India Pvt.
• Chapman W.A.J " Workshop Technology " volume I,II.III, ELBS.
• Hajra Choudhary S.K. , Bose S.K. "Elements of Workshop Technology" Volume I,II
• Begman, Manufacturing Processes.

Syllabus

Programme: B.Tech (Civil) Sem – I(2021)

Course: Fundamentals of Problem Solving Logic(Using C)		
TEACHING SCHEME: Theory: -- Tutorial: --	**EXAMINATION SCHEME:** Semester End Examination: -- Internal Assessment: --	**CREDITS:** Credits: --
Practical: 2 Hours / Week	Term Work: 25 Marks Oral: --	Practical: 1

Course Pre-requisites: The students should have knowledge of	
1	Basic knowledge of Computer Handling
Course Objective:	
1	To provide an overview of computers and problem-solving methods using 'C' Language
2	To serve as a foundation for the study of programming languages.
Course Outcomes: The student will be able to	
1	Know computer systems
2	Understand concept and steps towards problem solving
3	Understand fundamental concepts of C programming language
4	Use decision control structures
5	Use modular programming approach
6	Use of arrays and structures

Course Content:

UNIT - I	**Introduction to Computing:** Components of Computer Systems, Concept of hardware and software, Types of software, Concept of computing, data and information, Introduction to computer programming, Types of programming languages, Software Development Life Cycle	
UNIT - II	**Problem solving Techniques:** Steps in problem solving techniques: Define the problem, Formulate the mathematical model, develop an algorithm, Write the code for the problem, Test the program. Introduction to program planning tools-algorithm, flowcharts, pseudo codes	
UNIT - III	**Programming language 'C':** Features of C, basic concepts- header files, compiling and executing a C program, variables, data types, Operators- assignment, arithmetic, relational, logical, increment and decrement, Input and Output functions-print f and scan f	
UNIT - IV	**Decision Control Structures in 'C':** if-else statement, nested if-else, use of logical operators, Loop control structure: for, while, do-while loops, use of break and continue, Case control structure: switch case	
UNIT - V	**Function:** Types of functions, Function definition and declaration, function prototype, calling and returning function, passing values between	

	functions, standard library functions and user defined functions, passing array as function parameter, Recursive function.	
UNIT - VI	**Arrays and structures in 'C':** Concept, declaration, initialization, processing with array, one and multidimensional array, Strings. Structures in 'C': Concept, declaration, accessing structure elements, Array of structures, Pointer to structures, Uses of structures.	
Internal Assessment:		
	NA	
Term Work: Term-work will consist of following assignments		
1	Write a C program to check prime number and even-odd numbers	
2	Write a C program to print sum of digits 1 to 10	
3	Write a C program to swap two numbers	
4	Write a C Program to check whether an alphabet is vowel or consonant	
5	Write a C Program to Find the Length of a String without using string functions	
6	Write a C program to find area and circumference of circle	
7	Write a C program to accept the length of three sides of a triangle and to check triangle as equilateral or not	
8	Write a C program to implement linear search technique	
Oral/Practical:		
	NA	

Reference Books:

1) Kanetkar, Yashavant P. Let us C. BPB publications, 2004.
2) Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language", Prentice Hall, ISBN 0131103628, Second Edition
3) Donald E. Knuth, "The Art of Computer Programming", Vols. 1, Addison-Wesley, ISBN13: 978-0201485417, ISBN-10: 0201485419
4) T. E. Bailey, "Program design with pseudo code", Brooks/Cole Publisher, ISBN-10: 0534055745, ISBN-13: 978-0534055745
5) Subrata Saha and Subhodip M., "Basic Computation and Programming with C", Cambridge University of Press, India, ISBN:9781316601853
6) Lamey Robert, "Logical problem solving", Prentice Hall, ISBN: 9780130618825
7) Henry Mullish, Herbert L. Cooper, "The Spirit of C", Thomson Learning, ISBN 0314285008

Syllabus

Programme: B.Tech Civil Sem - II Course (2021)

<table>
<tr><td colspan="3">Course: Integral Calculus</td></tr>
<tr><td><u>TEACHING SCHEME:</u></td><td><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS</u> ALLOTTED:</td></tr>
<tr><td>Theory: 4 Hours / Week</td><td>End Semester Examination: 60 Marks
Internal Assessment: 40 Marks</td><td>Theory: 04</td></tr>
<tr><td>Tutorial: 1 Hour / Week</td><td></td><td>Tutorial:-01</td></tr>
</table>

<table>
<tr><td colspan="2">Course Pre-requisites: The students should have knowledge of</td></tr>
<tr><td>1</td><td>Student should have Basic Knowledge of differential calculus</td></tr>
<tr><td colspan="2">Course Objectives:</td></tr>
<tr><td>To study</td><td>1. Methods to evaluate first order, first degree differential equations and its applications in engineering problems.
2. Distinct co-ordinate systems, fourier series and curve tracing.
3. Various techniques for integral calculus and its applications in engineering problem.</td></tr>
<tr><td colspan="2">Course Outcomes: The student will be able to</td></tr>
<tr><td>1</td><td>Understand and evaluate first order and first degree differential equations.</td></tr>
<tr><td>2</td><td>Understand the formulation of physical systems as first order, first degree differential equation and evaluate particular solution of it</td></tr>
<tr><td>3</td><td>Understand the Fourier series and apply it to represent periodic function</td></tr>
<tr><td>4</td><td>Understand and evaluate methods of integral calculus and curve tracing.</td></tr>
<tr><td>5</td><td>Understand co-ordinate system and apply it to solve locus problems.</td></tr>
<tr><td>6</td><td>Understand concept of multiple integral and apply it to evaluate area, volume, centre of gravity and moment of inertia.</td></tr>
</table>

<table>
<tr><td colspan="3">Course Content:</td></tr>
<tr><td>Unit - I</td><td>Differential Equations (DE):
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types</td><td>(08 Hrs)</td></tr>
<tr><td>Unit - II</td><td>Application of DE:
Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff’s Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, One–Dimensional Conduction of Heat.</td><td>(08 Hrs)</td></tr>
<tr><td>Unit - III</td><td>Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series,Harmonic Analysis.
Integral Calculus: Differentiation Under the Integral Sign, Error functions.</td><td>(08 Hrs)</td></tr>
<tr><td>Unit - IV</td><td>Integral Calculus: Reduction formulae, Beta and Gamma functions
Curve Tracing: Tracing of Curves, Cartesian, Polar. Rectification of Curves</td><td>(08 Hrs)</td></tr>
<tr><td>Unit - V</td><td>Solid Geometry: Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder</td><td>(08 Hrs)</td></tr>
<tr><td>Unit - VI</td><td>Multiple Integrals and their Applications: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square</td><td>(08 Hrs)</td></tr>
</table>

	Values.	

Text Books:

1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill),Edition ,2008.
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar (Pune Vidyarthi GrihaPrakashan, Pune), 7th Edition, 1988, Reprint 2010.

Reference Books:

1. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2nd ,Edition, 2002.
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8th Edition, 1999,Reprint 2010.
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.) , 6th Edition,1995
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi),42th Edition ,2012.

Syllabus for

Unit Test-I - UNIT – I, II, III

Unit Test-II - UNIT- IV,V,VI

Project Based learning topics for Integral Calculus:

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.

1. Formation of differential equation
2. Exact differential Equation
3. Linear differential equation
4. Newton’s law of cooling
5. Newton’s second law of motion
6. Fourier’s law
7. Kirchhoff’s voltage law
8. Fourier series
9. Harmonic analysis
10. Gamma and beta function
11. Curve tracing
12. Locating position in three dimensional space
13. Multiple integrals applications
14. Error function
15. Differentiation under integral sign

Course: Acoustics and Modern Physics

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 3Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 3
Practical: 2 Hours / Week	Term Work: 25Marks	Term Work :1
		Total: 4

Course Pre-requisites: The students should have knowledge of

1	Basic understanding of physics and calculus.

Course Objectives:

	To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Civil Engineering.

Course Outcomes: The student will be able to

1	Summarise the terms damping constant, characteristic frequency, kinetic and potential energy of a spring.
2	Relate the problems associated with architectural acoustics and give their remedies.
3	Connect the problems associated with defects and use ultrasonic as a tool in industry for non-destructive testing.
4	Summarise and solve the engineering problems on Electromagnetism.
5	Correlate the principles of different types of polarization and structural phase transitions phenomena in ferroelectric systems.
6	Infer the wave nature of light and apply it to measure stress, pressure and dimension etc.

Course Content:

UNIT - I	**Waves and oscillation** Periodic motion, simple harmonic motion, characteristics of simple harmonic motion, vibration of simple springs mass system (Different combinations), Resonance - definition, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.	**(06 Hours)**
UNIT - II	**Architectural Acoustics** Elementary acoustics, Limits of audibility, Audibility curve, Noise and musical sound, timbre, Reverberation and reverberation time, Sabine's formula (without Derivation), Intensity level, Sound intensity level, Loudness, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.	**(06 Hours)**
UNIT - III	**Ultrasonic & NDT** Introduction to ultrasonic, Production of ultrasonic by magnetostriction and	**(06 Hours)**

	piezoelectric methods Classification of Non-destructive testing methods, Principles of physics in Non-destructive Testing, Advantages of Non-destructive testing methods, Acoustic Emission Testing, Ultrasonic (thickness measurement, flaw detection), Radiography testing.	
UNIT - IV	**Electromagnetic Wave** Displacement current, Maxwell's equations (derivation), Wave equation for electromagnetic waves, Propagation in free space, Poynting theorem, Characteristic of Transverse electric and magnetic waves, Skin depth, Rectangular and circular waveguides.	**(06 Hours)**
UNIT - V	**Engineering Materials and Applications** Paramagnetic materials, diamagnetic materials, ferromagnetic materials, Dielectrics and electric polarisation. Liquid crystals: Noematic, Semitic and cholesteric phases, Liquid crystal display. Multiferroics: Type I & Type II multiferroics and applications, Magneto resistive Oxides: Magnetoresistance.	**(06 Hours)**
UNIT - VI	**Wave optics** **Interference** Interference of waves, interference due to thin film (Uniform and nonuniform), Applications of interference (optical flatness, interference filter, non-reflecting coatings. **Diffraction** Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima **Polarisation** Introduction, Double refraction and Huygens's theory, Positive and negative crystals, Nicol prism, Dichroism.	**(06 Hours)**
Internal Assessment:		
Part- A	UNIT TEST – I and II	
Part- B	**Assignments:** Six assignments to be given by the subject teacher (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum	
Term Work:		
	The term-work shall consist of any eight of the following.	
	1. Oscillation of a Spring - Mass System and a Torsional Pendulum	
	2. To study normal modes of oscillation of two coupled pendulums and to measure the normal mode frequencies.	
	3. To study normal modes of transverse vibration of a stretched string	
	4. Study of resonance in LCR circuit	
	5. To determine the velocity of sound	
	6. Measurement of average SPL across spherical wave front and behavior with the distance	

	7. Expansion chamber muffler: investigation of muffler response as a filter in the low frequency approximation by determining insertion loss.	
	8. Interference of sound using PC speakers	
	9. Determination of velocity of sound in liquid by ultrasonic interferometer	
	10. Ultrasonic probe - a study	
	11. Plotting the hysteresis loop for given magnetic material	
	12. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings	
	13. Determination of wavelength of light using diffraction grating	
	14. Determination of resolving power of telescope	
	15. Determination of thickness of a thin wire by air wedge	
	16. Determination of refractive index for O-ray and E-ray	

Textbooks:
1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)
Reference Books:
1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid-State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)
11. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
Topics for project-based Learning for Acoustics and Modern Physics
1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development

4. Double pendulum and its application
5. Comparison of various method used in measuring the gravitational constant g
6. The physics of stars and their astronomical identification
7. Design and construction of digital distance measuring instrument
8. Electronic eye (Laser Security) as autoswitch/security system
9. Electric power generation by road power
10. Measurement /simulation of reverberation time
11. Study of vibration of bars
12. Determination of absorption coefficient of sound absorbing materials
13. Determination of velocity of O-ray and E-ray in different double refracting materials
14. Need of medium for propagation of sound wave
15. Small wind turbines as a source of electricity

Syllabus

Programme: B. Tech. Civil Sem - II Course (2021)

Course: Statics and Dynamics		
TEACHING SCHEME: Theory: 04 Hours / Week	**EXAMINATION SCHEME:** Semester End Examination: 60 Marks Internal Assessment: 40 Marks	**Total CREDITS: 05** Theory:04
Practical: 02 Hours / Week	Term Work: 25 Marks	Term work: 01

Course Pre-requisites: The students should have knowledge of	
1	Physics-Forces, Newton's law of motion, Concept of physical quantities, their units and conversion of units, Scalar and Vector
2	Mathematics-Algebra, Geometry, Concept of differentiation and integration
Course Objective:	
	The student should be able to determine effect of forces on rigid objects in static and dynamic state.
Course Outcomes: The student will be able to	
1	calculate resultant and apply conditions of equilibrium.
2	calculate friction force and its effect.
3	analyze the truss
4	calculate centroid and moment of inertia.
5	evaluate kinematic effect of forces
6	evaluate kinetic effect of forces

Course Content:		
Unit - I	**Resultant and Equilibrium** Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	**(08Hrs)**
Unit - II	**Friction** Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts.	**(08 Hrs)**
Unit - III	**Analysis of Truss** Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	**(08 Hrs)**
Unit - IV	**Centroid and Moment of Inertia** Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	**(08 Hrs)**
Unit - V	**Kinematics of a Particle** Cartesian components, Normal and Tangential components of motion, Relative motion, Dependent motion, Motion of a Projectile,	**(08 Hrs)**
Unit - VI	**Kinetics of a Particle** D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	**(08 Hrs)**
Assignments:		
	1) Explain different types of forces and types of supports.	
	2) Calculate resultant of given force system	

	3) Calculate support reactions of the beam	
	4) What is equilibrium? What are conditions of equilibrium?	
	5) Calculate friction force for Blocks and Ladders.	
	6) Calculate tension on sides of Belts.	
	7) Calculate forces in members of truss.	
	8) Calculate centroid of given area.	
	9) Calculate moment of inertia of given area.	
	10) Calculate relative velocity of bodies.	
	11) Calculate motion and path of projectile.	
	12) Apply D'Alemberts Principle to solve given problem.	
	13) Apply Work-Energy Principle to solve given problem.	
	14) Apply Impulse-Momentum Principle to solve given problem.	
	15) Calculate velocity of bodies after impact.	
Term Work: The term-work shall consist of -		
	Part-A: Minimum **Five** experiments from list below.	
	1) Study of equilibrium of concurrent force system in a plane	
	2) Determination of reactions of Simple and Compound beam.	
	3) Determination of coefficient of friction for Flat Belt.	
	4) Determination of coefficient of friction for Rope.	
	5) Determination of Centroid of line or plane elements.	
	6) Study of Curvilinear motion.	
	7) Determination of Coefficient of Restitution.	
	Part-B: Minimum **Five** graphical solutions of the problems on different concepts in course content.	
Reference Books:		
1) Hibbeler R.C., "Engineering Mechanics (Statics and Dynamics)", McMillan Publication		
2) Beer F.P. and Johnston E.R., "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Tata McGraw Hill Publication.		
3) Bhavikatti S.S. and Rajashekarappa "Engineering Mechanics", K.G., New Age International (P) Ltd.		
4) Shames I.H., "Engineering Mechanics (Statics and Dynamics)", Prentice Hall of India (P) Ltd.		
5) Singer F.L., "Engineering Mechanics (Statics and Dynamics)", Harper and Row Publication		
6) Meriam J.L. and Kraige L.G., "Engineering Mechanics (Statics and Dynamics)", John Wiley and Sons Publication		
7) Timoshenko S.P. and Young D.H., "Engineering Mechanics (Statics and Dynamics)", McGraw Hill Publication		
8) Tayal A.K., "Engineering Mechanics (Statics and Dynamics)", Umesh Publication		
9) Mokashi V.S., "Engineering Mechanics-I and II (Statics and Dynamics)", Tata McGraw Hill Publication		
Syllabus for Unit Test:		
Unit Test -1 :UNIT – I to III		
Unit Test -2 :UNIT – IV to VI		
Topics for Project based Learning for Statics and Dynamics		

Syllabus

Programme: B. Tech. Civil Sem - II Course (2021)

1. Prepare model for various types of beams.
2. Prepare model for various types supports.
3. Prepare chart for various types of force system with suitable real-life examples.
4. Collect the various situations where varignon's theorem is used.
5. Prepare model or chart for equilibrium system of forces of various engineering applications.
6. Prepare chart for different types for trusses with showing various members.
7. Prepare prototype model of any one type of truss.
8. Calculate the forces in members of truss by using analytical method and check it graphically (At least three problems for different types of trusses)
9. Prepare chart of method of joint and method section for analysis of truss with stepwise procedure.
10. Prepare prototype models of the basic geometrical figures and locate the centroid of them.
11. Prepare prototype models of the I and T section and locate the centroid of them.
12. Prepare chart for parallel axis and perpendicular axis theorem with suitable example.
13. Prepare chart regarding the types of friction in various field conditions.
14. Prepare chart for application of friction.
15. Prepare chart for derivation of tangential and normal acceleration.
16. Prepare chart related to projectile motion with suitable example.
17. Development of excel sheet for projectile motion (at least three problems).
18. Development of excel sheet for work energy principle (at least three problems).
19. Prepare chart for work energy and Impulse momentum principle with suitable example.
20. Development of excel sheet for calculation of coefficient of restitution (at least three problems)

Syllabus
Programme: B. Tech. (Civil) – Sem - II CBCS 2021 Course

Basic Land Surveying

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED: 05
Theory: 04Hours / Week	End Semester Examination: 60 Marks	Theory: 04 Credits
Practical: 02Hours / Week	Internal Assessment: 40 Marks	
	Term work: 25 Marks Practical: 50 Marks	Practical: 01 Credits

Course Pre-requisites:

The Students should have knowledge of

1.	Basic Mathematics and geometry

Course Objectives:

	To develop the knowledge of basic Surveying techniques required for various construction projects.

Course Outcomes:

On completion of the course, the students will be able to:

1.	Use instruments for linear measurements and prismatic compass for angular measurements.
2.	Use instruments for levelling and compute reduced levels of ground points
3.	Use Vernier theodolite for angular measurements and for other applications.
4.	Use of Tacheometer for computation of distances and reduced levels. Use plane table and its accessories for surveying.
5.	Set out simple circular curves by various methods.
6.	Conduct surveys for various construction projects and explainuse of modern instruments.

UNIT - I	**Linear measurements and Compass survey**	**(8Hours)**
	Principle, objectives and classification of Surveying. Linear measurements, methods, types of tapes, ranging, field work and plotting. Principle and working of EDM. Compass Survey: types of meridians and bearings, construction and use of prismatic compass, local attraction and its correction, dip and declination.	
UNIT - II	**Vertical measurements**	**(8Hours)**
	Introduction, types of levels, principle axes of levels ,auto level and its working, temporary and permanent adjustments of auto-level,types of levelling staves, computation of reduced levels, profile levelling and cross sectioning. Contouring – direct and indirect methods, uses of contour maps. Introduction to trigonometrical levelling.	
UNIT - III	**Theodolite Survey**	**(8Hours)**
	Study and use of Vernier 20” theodolite, principle axes and temporary adjustments, measurements of horizontal angles by repetition and reiteration method, measurement of vertical angles and other uses, theodolite traversing: computation of consecutive and independent coordinates, adjustment of closed traverse by transit and Bowditch rule, simple cases of omitted measurements.	
UNIT - IV	**Tacheometry and Plane Table Survey**	**(8Hours)**

Syllabus

Programme: B. Tech. (Civil) – Sem - II CBCS 2021 Course

	Principle of stadia tacheometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points. Plane table survey, equipment's their uses, methods of plane table survey- radiation, intersection, traversing and resection, errors and precision pf plane table survey.	
UNIT - V	**Curves**	**(8Hours)**
	Necessity of providing curves, simple circular curves, elements, setting out circular curves by radial and perpendicular offsets, offsets from long chord and offsets from chords produced. Angular method of deflection angles. Transition curves, necessity and types.	
UNIT - VI	**Construction Survey and modern equipment's**	**(8Hours)**
	Setting out buildings, survey for roads and tunnels, survey for drainage line, location of bridge piers. Introduction to Total station and its uses, use of digital planimeter for area measurement, study and use of toposheets.	
Assignments:		
1	Computation of corrected bearings of the traverse by different methods.	
2	Solving problems on calculation of reduced levels by different methods.	
3	Preparing contour map of the area from the given spot levels.	
4	Solving problems on trigonometrical leveling.	
5	Computations of independent coordinates of a closed traverse.	
6	Solving problems on omitted measurements.	
7	Calculation of reduced level and distance of a point by tacheometry.	
8	Write details of survey for drainage line with proper sketches.	
Term Work: The term work shall consist of Field book and drawing containing record of (any 12) exercises and project listed below.		
1	Linear measurements with tape and accessories.	
2	Study and use of Prismatic compass.	
3	Study and use of auto level and double check leveling	
4	Compound leveling and fly leveling, calculation by rise and fall method.	
5	Study and use of 20" Vernier Theodolite.	
6	Measurement of horizontal angle of triangle by repetition method and applying check.	
7	Measurement of vertical angle by transit Theodolite	
8	Trigonometrical levelling by transit Theodolite.	
9	Project 1 Road project of minimum length of 250 M including fixing of alignment, profile leveling and cross sectioning.(Two full imperial drawing)	
10	Project 2 Theodolite traverse survey of closed traverse for minimum 0.5	

	hectares area including building roads etc. (One full imperial drawing)	
11	Computation of horizontal distance and elevation of points by tachometry for horizontal and inclined sights.	
12	Introduction and study of outfit of plane table and method of radiation.	
13	Intersection method of plane table survey.	
14	Closed plane table traverse survey around a small four-sided building.	
15	Setting out simple circular curve by Rankin's method of deflection angle	
Text Books		
1	Surveying and Levelling Vol I and. II-T.P. Kanetkar and S.V. Kulkarni.	
2	Surveying Vol. I & II - Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain.	
3	Surveying for Engineers- John Uren & Bill Price- Palgrave Macmillan	
4	Plane Surveying- A.M.ChandraNew age International Publishers	
5	Surveying and Levelling- N. N. Basak, Tata Mc-Graw hill	
6	Surveying Vol. I & II - Dr. K. R. Arora.	
Reference Books:		
1	Surveying: Theory and practice-James M. Anderson, Edward M. Mikhail	
2	Surveying theory and practices-Devise R. E., Foot F.S.	
3	Plane and Geodetic Surveying for Engineers. Vol. I -David clark.	
4	Principles of Surveying. Vol. I - J.G.Olliver, J.Clendinning	
5	Surveying Vol. I & II -S.K.Duggal, Tata Mc-Graw Hill.	
6	Surveying and Levelling - Subramanian, oxford University Press.	
Syllabus for :		
Unit Test-I	UNIT – I, II, III	
Unit Test-II	UNIT- IV,V,VI	
Project List :		
Unit I	**Linear measurements and Compass survey**	
1	Collect Information of Linear measurement techniques/ instruments from old age till 21st century, write report along with photos	
2	Conduct closed traverse by prismatic compass and do the necessary calculations	
Unit II	**Vertical measurements**	
3	Prepare counter sheet by using Excel	
4	Collect Information of Vertical measurement techniques/ instruments from old age till 21st century, write report along with photos	
5	Vist to laboratory and collect information of levelling instrument and make ppt.	
Unit III	**Theodolite Survey**	
6	Make a PPT on Problem Solved by Bowditch Rule and present it in class	

Syllabus

Programme: B. Tech. (Civil) – Sem - II CBCS 2021 Course

7	Make a PPT on Problem Solved by transit Rule and present it in class	
8	Leaflet on uses of Theodolite	
Unit IV	**Tacheometry and Plane Table Survey**	
9	Write a report on- " Is Tacheometry and Plane table are required in today's digital world?"	
10	PPT on working of plane table	
11	Make vedio – of your own demonstrating parts and working of Tacheometry, share it with your classmate and take feed back	
12	Digital booklet on numerical of Tacheometry share it with your classmate and take feed back	
Unit V	**Curves**	
13	Take Photograph of Curves of road you usually use and make a poster and display it on Notice Board.	
14	Digital booklet on numerical of Rankine's method of Curves share it with your classmate and take feed back	
15	Digital booklet on numerical of offset from long cord method of Curves share it with your classmate and take feed back	
Unit VI	**Construction Survey and modern equipment's**	
16	Collect information of latest surveying instrument : its cost, salient features and image and prepare Chart and display it on notice board.	
17	Prepare Digital Chart on Importance of Basic Land Surveying in Civil Engineering share it and collect feed back	
18	Present your idea of modification of any survey instrument in front of class.	
19	Collect information on various software available for surveying	
20	Prepare leaflet on Surveying for various projects.	

Draft Syllabus

Programme:B.Tech Civil (2020)
Sem - II (Civil)

Course: Construction Design & Drawing

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED: 04
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03 Credits
Practical: 2 Hours / Week	Term Work : 25 Marks Oral : 25 Marks	Term Work and Oral : 1 Credits

Course Pre-requisites: The students should have knowledge of		
1	Building Construction, Building materials, Knowledge of Engineering Graphics	
Course Objectives:		
	To make the student illustrate the process of building planning and building byelaws	
Course Outcomes: The student will be able to		
1	apply various Principals of planning and building byelaws.	
2	apply design considerations for climate, ventilation, Noise & Acoustics in building planning.	
3	apply design considerations for various building services & fire protection in building planning.	
4	apply design considerations for plumbing services in building planning.	
5	Understand the concept of .development plan	
6	define the legal aspects of plan sanctioning.	
Course Content:		
UNIT - I	**Buildings Planning and Regulations** Principles of planning for building, Integrated approach in Built Environment. Building Rules Regulations and Byelaws necessity, (National Building Code), plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation; Principles of Architectural design – form, function, utility, aesthetics.	**(06 Hours)**
UNIT - II	**Types of Buildings** (a) Types of Residential Building units – Bungalows, Twin bungalows, Row houses, Apartments; Requirements of Public buildings - Educational buildings, buildings for health care, industrial buildings and commercial buildings; Types of drawings - Submission drawings, working drawings and Architectural drawings, Perspective drawings. (b) Concept of ECO building, Green buildings, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings.	**(06 Hours)**
UNIT - III	**Climate, Ventilation and Acoustics** Elements of climate, thermal design Principles, Heat exchange of building, Thermal insulation of roof and wall. Function of ventilation, stack effect wind effect, Mechanical ventilation, Air conditioning systems. Effect of noise, Noise control sound insulation, Acoustics reverberation Sabine's formula, acoustical defects, conditions of good acoustics.	**(06 Hours)**
UNIT - IV	**Building Services** Constructional requirements for different building services like Electrical, Telecommunication services, Circulation-Lift Types and Capacity, escalators,	**(06 Hours)**

	Entertainment services. Fire Protection – Fire safety, fire load, grading of occupancies by fire load, fire escape elements. Plumbing services, fixtures and fastenings, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems.	
UNIT - V	Necessity and evolution of town planning in India. Development plan and its importance, Various surveys for development plan Objectives and Contents of DP, Land use zoning, Concept of regional plan.	**(06 Hours)**
UNIT - VI	**Legal Aspects of Plan Sanctioning** Role of Plan Sanctioning Authority for layout, co-op Housing societies and apartments. Ownership of land, plot, 7/12 abstract, meanings of different terms of 7/12 abstract (Khasra), 6-D form, list of documents to be submitted along with building Plan for sanction from the authority. TDR, certificate of commencement and completion, various no objection certificates to be produced, format of permissions from pollution control board, MSEB, Water Supply and Drainage Department, State or National Highway Department.	**(06 Hours)**
Assignments: Students should perform theoretical / experimental assignment/s from the list below		
1	Assignment on Building Bye laws for residential buildings	
2	Requirements of Green and intelligent buildings	
3	Describe principles of Thermal design of buildings.	
4	Prepare a layout for water supply and drainage of residential building.	
5	Assignment on Development plan of a city	
6	State and describe various legal documents for building construction.	
Term Work:		
	Preparation of working drawings of any one of the buildings listed below: a) Residential Building b) Commercial Building c) Educational Building d) Industrial Building e) Recreational Building f) Health Club	
	Sheets to be drawn 1) Plan/Typical floor plan to a suitable scale. 2) Elevation and section to a suitable scale. 3) Site plan showing water supply and Drainage 4) Foundation Plan to a suitable scale.	
Text Books:		
1. S.P. Bindra S.P. Arora, "Building Construction", Laxmi Publication		
2. M. L. Shah, C. M. Kale, S. Y. Patki, "Building Drawing with integrated approach to Built Environment", Tata McGraw Hill Publishers		
3. Rangwala, "Town Planning" , Charaotar Publications		
Reference Books:		
1. IS provisions "National Building Code"		

2. "Development Control Rules" of local plan sanctioning authority	
3. Calendar, "Time Saver Standards for Architectural Design", Tata McGraw Hill Publishers	
4. Merit, "Building Design and Construction", Tata McGraw Hill Publishers	
Syllabus for	
Unit Test-I	UNIT – I, II, III
Unit Test-II	UNIT- IV,V,VI

Project Based Learning

1 Study of National Building code of India to find Building Bye laws for planning residential buildings.

2. With the help of 3 different case studies of residential buildings study the application of Principles of building planning.

3 Preparing a measured drawing of a two bed room residential building (Plan, Elevation and section)

4 Take case study of green building and study provisions with reference to energy saving, solid waste management, recycling of water , use of green building materials.

5 With the help of site visit determine planning requirements for health care buildings and prepare a report.

6. With the help of site visit determine planning requirements for commercial buildings and prepare a report.

7 Study the architectural and working drawings for a building construction project and prepare a report.

8 With the help of site visit prepare a plumbing layout of a residential building and study various fixtures for plumbing.

9 Study of fire safety arrangements for high rise buildings and prepare a report.

10 Study the process of preparing development plan of a city and prepare a report.

11 With the help of case study prepare a report on zoning in Development plan.

12 With the help of site visit determine planning requirements for recreational buildings and prepare a report.

13. Take a case study of intelligent building and study various provisions and prepare a report.

14 Study the foundation plan of a residential building and prepare a report on lineout of a building.

15 Study the electrical layout plan of a building construction project and prepare a report.

16. Study of various legal documents such as 7/12 extract, TDR certificate, completion certificate.

17. With the help of site visit determine planning requirements for primary school building and prepare a report.

18. Study development control rues of the local authority and prepare a report.

19 With the help of site visit determine planning requirements for high rise building and prepare a report.

20 Study of Landscape details in a residential complex and prepare a report.

Syllabus

Programme: B. Tech. Civil Sem - II Course (2021)

Course: Civil Engineering Software – I (AutoCAD)

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED: 01**
Practical: 02 Hours / Week	Term Work : 25 Marks Practical : 25 Marks	TW & PR :01

Course Pre-requisites: The students should have knowledge of

1	Knowledge of basic building aspects
2	Knowledge of various building components.
3	Knowledge of various building symbols

Course Objectives:

To make student capable of drawing any kind of Engineering drawing using AutoCAD.

Course Outcomes: The student will be able to

1	draw various Engineering drawing using AutoCAD.
2	draw various elements of a building.
3	draw various elevation and sections of the building.
4	Draw and explain various modelling concepts of building construction and building drawing by using AutoCAD.

Course Content:

UNIT - I	**Introduction to AutoCAD and Command:** Introduction to AutoCAD, Basic AutoCAD commands- Line, Circle, Polyline, Rectangle, Polygon, Array, Trim, Offset, Fillet, Champers, Units, Limits, Move, Copy, Paste, Drawing space, Layout, Model.	
UNIT - II	**Simple Plan Drawing:** Small bungalow plan scaled print out on A3 sheet, 1 BHK and 2 BHK Flats and bungalow plans, Elevation and Section.	
UNIT - III	**3D Drawing:** 1 BHK Bungalow plans, 3D Truss, 3D Industrial shed, Steel drawing for bungalow.	

Term Work:

The term-work shall consist of:

1) AutoCAD Drawing of small objects
2) AutoCAD Drawing of plan, elevation and section of small building.
3) AutoCAD 3D view of small building.

Text Books:

“ Mastering AutoCAD 2016 and AutoCAD LT 2016 by Goerge Omura”

“ Mastering AutoCAD 2017 and AutoCAD LT 2017 by Goerge Omura”

“ Mastering AutoCAD 2018 and AutoCAD LT 2018 by Goerge Omura”

“AutoCAD 2018 Instructor perfect paperback by james A. Leach”

“Beginning AutoCAD Exercise workbook 2018 by Cheryl R. Shrock”

Reference Books:

“AutoCad : 2D Reference guide : 1 Paperback=1 january 2010 by C. S. Changeriya”

“AutoCAD 14 (The Complete Reference) Paperback – Import, 1 December 1998 by David S. Cohn”

Syllabus

Programme: B. Tech. Civil Sem - II Course (2021)

Course: Object-Oriented Programming (Using C++)		
TEACHING SCHEME: Practical: 2 Hours / Week	**EXAMINATION SCHEME:** Term Work: 25 Marks	**CREDITS:** Term Work: 1

Course Pre-requisites:	
1	The students should have basic Knowledge of “C” programming language.
Course Objective:	
	Students will be able to do basic program in C++
Course Outcomes: The student will be able to	
1	Explain different Concepts of OOP, Characteristics of OOP.
2	Demonstrate the use of Data type , Keywords ,Tokens and Control Structures to Solve given Problem.
3	Demonstrate the use of functions to solve real world problem.
4	Compare different types of inheritance to solve given problem.
5	Explain different Types of Constructor and Destructor.
6	Develop OOP applications using file Handling.

Course Content:	
Unit -I	**Introduction to Object Oriented Programming:** Introduction to Object Oriented Programming, Basic Concept of OOP,Characteristics of OOP, Need for OOP, Benefits of OOP, Object Oriented Languages, Applications of OOP.
Unit -II	**Beginning with C++:** Overview of C++, Sample C++ Program, C++ statements, Structure of C++ program, Creating source file , compiling and Linking C verses C++, C++ Characteristics, Structure of C++ program, Tokens, Keywords , Identifiers and Constants, Data Types ,Declaration of variables, Dynamic initialization of variables, Control Structures.
Unit -III	**Functions in C++:** Function Prototyping, Call by Reference, Inline functions, Default arguments, Function Overloading , Friend and Virtual Functions . **Classes and Objects:** Class specification , Class Objects , Scope resolution operator, Access specifies Public, Private, Protected, Defining member Functions, Nesting of Member Functions, Private Member Functions, Static Data Members , Static Member Functions,
Unit - IV	**Inheritance and Polymorphism:** Defining Derived Classes, Types of Inheritance, Virtual Base Class, Abstract class. Polymorphism: Base class, Virtual Functions, Pure Virtual Functions, Calling a virtual function through a base class reference, Early and Late Binding.
Unit - V	**Constructors and Destructors:** Constructors, Parameterized constructors, Default Constructors, Copy constructor, Dynamic Initialization of Objects, Destructors.
Unit - VI	**Managing Console I/O operations:** C++ Stream Classes, Unformatted I/O Operations, Working with Files, Opening and Closing a file, Formatted I/O.

Syllabus

Programme: B. Tech. Civil Sem - II Course (2021)

Term Work:		
1.	Study of different Object Oriented Programming Concept ,Application and benefits of OOP.	
2.	Write a C++ program to find whether given number is perfect number or not.	
3.	Write a C++ Program to find Fibonacci Series.	
4.	Write a C++ Program to find Area of Circle and Triangle Using concept of Function Overloading.	
5.	Write a C++ program for simple Calculator using Class and Object Concept.	
6.	Write a C++ Program for Employee Management System Using Single inheritance, Multiple inheritance and Multilevel inheritance.	
7.	Write a C++ Program to implement Concept of Constructor and Destructor.	
8.	Write a C++ Program for Storing Student Information with the help of File reading and Writing Operations.	

Reference Books:

1) Herbert Schildt, "The Complete Reference C++", 4thEdition, Mc Graw Hill, 2003.
2) Stanley. B. Lippmann, Josee Lajoie, Barbara. E. Moo, "C++ Primer", 5th Edition, Pearson Education, 2013.
3) Scott Meyers:"Effective C++",Third Edition, Addison-Wesley, 2005.
4) E. Balaguruswamy, "Object Oriented Programming using C++", 4th Edition, Mc Graw Hill, 2010

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

Program: B. Tech. Civil **Sem: III** **CBCS2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Mechanics of Solids	3	2	1	60	40	25	25	-	150	3	1	1	5
2.		Construction Equipment and Methods	4	2	-	60	40	25	-	-	125	4	1	-	5
3.		Fluid Mechanics	4	2	-	60	40	25	25	-	150	4	1	-	5
4.		Economics and Finance	3	-	-	60	40	-	-	-	100	3	-	-	3
5.		Concrete Technology*	4	2	-	60	40	25	25	-	150	4	1	-	5
6.		Vocational Course-I : AutoCAD 3D	-	2	-	-	-	25	25	-	50	-	1	-	1
7.		Data Analytics Using Python	-	2	-	-	-	25	-	-	25	-	1	-	1
	Total		**18**	**12**	**1**	**300**	**200**	**150**	**100**	**-**	**750**	**18**	**06**	**1**	**25**
	Social Activity- I **		-	-	-	-	-	-	-		-	-	-	-	2

*Industry Taught Course – I
**Mandatory Audit course with 100 marks end semester examination

Program: B. Tech. Civil **Sem: IV** **CBCS2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Vector Calculus and Differential equations	4	-	-	60	40	--	--	--	100	4	--	--	4
2.		Open Channel flow and Hydraulic Machinery	4	2	-	60	40	25	25	--	150	4	1	--	5
3.		Geomechanics	4	2	--	60	40	25	25	--	150	4	1	-	5
4.		Analysis of Determinate Structures	3	-	1	60	40	--	--	--	100	3	-	1	4
5.		Planning and Management of Construction Projects*	4	2	-	60	40	25	25	--	150	4	1	-	5
6.		Vocational Course-II :Plumbing Engineering	--	2	-	-	-	25	25	--	50	--	1	-	1
7.		Construction Practices in Civil Engineering	-	2	-	-	-	50	--	--	50	--	1	-	1
		Total	**19**	**10**	**1**	**300**	**200**	**150**	**100**		**750**	**19**	**5**	**1**	**25**
		MOOC-I**	--	--	--	-	-	--		--	--	-	-	-	2

*Industry Taught Course – II
**Mandatory Audit course with 100 marks end semester examination

Programme: B. Tech. (Civil) Sem – III (2021)

COURSE: MECHANICS OF SOLIDS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 03 Hours / Week Tutorial: 01 Hour / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03 Tutorial: 01
Practical: 02 Hours / Week	Term Work: 25 Marks Oral: 25 Marks	TW :01

Course Pre-requisites: The students should have knowledge of

1	Statics and Dynamics
2	Mathematics-Algebra, Geometry, Concept of differentiation and integration

Course Objective:

The student should be able to calculate stresses developed in the material.

Course Outcomes: The student will be able to

1	determine axial stresses in the member.
2	draw shear force and bending moment diagram for determinate beams.
3	calculate bending stresses and deflection of beam.
4	calculate shear stresses due to shear force and torsion.
5	calculate critical load on column.
6	compute principal stresses using analytical and graphical method.

Course Content:

Unit-I	**Simple Stresses and Strains** Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law; Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section	**(06Hrs)**
Unit-II	**Shear Force and Bending Moment Diagram** Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments Bending moment and loading diagram from given shear force diagram.	**(06 Hrs)**
Unit-III	**Bending Stresses and Deflection of Beam** Bending Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section. Deflection of Beams: Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.	**(06 Hrs)**

Unit-IV	**Direct and Torsional Shear Stress** Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section Torsion of Circular Shafts: Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in solid, hollow, solid, homogeneous and composite cross sections subjected to twisting moment.	**(06 Hrs)**
Unit-V	**Combined Stresses and Axially Loaded Column** Direct and bending stresses for eccentrically loaded short column, Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections. Axially loaded columns: concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula	**(06 Hrs)**
Unit-VI	**Principal Stresses and Principal Planes** Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.	**(06 Hrs)**

Internal Assessment:

	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV,V,VI

Assignments: Students should complete assignments from

1	Calculate the different stresses for determinate and indeterminate members.
2	Draw the shear force and bending moment diagram for different types loading acting on simply supported, compound and cantilever beam.
3	Draw the bending stress distribution diagram for different cross section.
4	Determination of slope and deflection of beam for various types of loading acting on beam.
5	Draw the shear stress distribution diagram for different cross section.
6	Calculate load carrying by column by using Euler's and Rankine Theory.
7	Calculate principal stress, normal and tangential stress by analytical and graphical method.

Term Work: The term-work shall consist of Minimum **Eight experiments** from list below.

1	Tension test on mild steel
2	Tension test on tor steel
3	Direct Shear (Single & Double) test on mild steel
4	Bending test on timber
5	Torsion test on mild steel
6	Impact tests (Izod & Charpy) - Mild Steel, Aluminium, Brass, Copper
7	Hardness test (Rockwell)- mild steel, aluminium, brass copper
8	Compressive Strength of brick
9	Construction of Mohr's Circle for calculation of principal stresses.
10	Development of an excel sheet for calculation of stresses at a point in cross section for given loadings.
11	Development of an excel sheet for calculation of principal stress at a point.

Reference Books:	
1	Beer F.P. and Johnston E.R., “Mechanics of Materials”, McGraw Hill Publication
2	Singer F. L. &Pytel A., “Strength of Materials”, Harper and Row Publication
3	Gere J.M. & Timoshenko S.P., “Mechanics of Materials”, CBS Publishers & Distributors
4	Bansal R.K., “Strength of Materials”, Laxmi Publications.
5	Ramamrutham S. “Strength of Materials” Dhanapat Rai Publications.
6	Bhavikatti S.S “Strength of Materials”, New Age Publications

Topics for project based Learning for Mechanics of Soilds
1. Draw the stress strain curve of mild steel and tor steel by using excel.
2. Collect the IS code related to testing of material and specifications for any five materials.
3. Prepare the chart for various types of stresses and strain with suitable example.
4. Development of an excel sheet for calculation of Elastic constants, Thermal stresses with suitable example.
5. Market survey for structural materials (at least ten materials)
6. Prepare the chart for Shear force and bending moment diagram for simply supported beam (At least Five problems with different types of loading)
7. Prepare the chart for Shear force and bending moment diagram for Cantilever beam (At least Five problems with different types of loading).
8. Prepare the chart for Shear force and bending moment diagram for overhanging beam (At least Five problems with different types of loading)
9. Development of an excel sheet for calculation of bending stresses for different sections. (At least three problem)
10. Prepare the chart for derivation of flexural formula and bending stress distribution diagram for different section.
11. Prepare the chart for deflection and slope of simply supported beam (at least five problems with different types of loading)
12. Prepare the chart for deflection and slope of cantilever beam (at least five problems with different types of loading)
13. Prepare the chart for derivation of shear stress formula and shear stress distribution diagram for different section.
14. Prepare the chart for derivation of torsional formula.
15. Development of an excel sheet for calculation of direct and bending stress in section. (At least three problem)
16. Prepare the chart for core section (square, rectangular, circular, hollow rectangular and hollow circular).
17. Development of an excel sheet for load carrying capacity of column by using Euler’s theory. (At least three problem)
18. Collect the photographs along with justification of (a) failure of short and long column (b) Failure of beam in bending and shear.
19. Draw the Mohr’s circle (at least five problems)
20. Prepare the chart for Calculation of normal and shear stress by using graphical method.

Programme : B.Tech. (Civil) Sem. – III (2021)

Course: Construction Equipment & Methods		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS: 05**
Theory: 04 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
Practical: 02 Hours / Week	Term Work: 25 Marks	Term Work: 01

Course Pre-requisites: The students should have knowledge of

1	Building Construction Practices, Building Planning & Design.
2	Engineering Economics.
3	Concrete Technology.

Course Objective:

Students should get knowledge of Construction Operation Equipment & different methods of advanced construction techniques, tunneling, concreting & dewatering.

Course Outcomes: The student will be able to

1	explain various advanced construction techniques.
2	apply different construction techniques for underwater construction.
3	identify and find output of earth moving equipment.
4	describe hoisting & conveying equipment.
5	Understand equipment key features, cost and find out its performance.
6	describe dewatering, paving equipment & concrete pumps

Course Content:

Unit-I	**Advanced Construction Techniques:** Construction - Light, Medium & Heavy duty. Launching of Girders, Precast Techniques, Tunnel Driving techniques, Tunnel boring machines (Open & Shield), Road Headers & Boomers, Shotcreting & Gunieting. Trenchless Technology, Micro Tunneling. Pneumatic Drilling equipments. Drill & Blast method.	**(08 Hrs)**
Unit-II	**Under Water Construction:** Cofferdams Dams & Caissons – Definition, Classification & its use. Dredging Techniques. Construction under deep water (Tremie Method). Classification & different types of Piles, Sheet Piles, Pile driving techniques, Negative skin friction. Use of special types of Formwork. Jetties.	**(08 Hrs)**
Unit-III	**Earth Work Machineries:** Fundamentals of Earth work operations. Earth Moving Operations - Types of Earth Work Equipment -Tractors, Motor Graders, Scrapers, Front end loaders – Dozer, Excavators, Rippers, Front Shovel, Back Hoe, Loaders, trucks, dumpers and hauling equipment, Compacting Equipment - Tamping Rollers, Smooth Wheel Rollers, Sheepsfoot Roller, Pneumatic-tyred Roller, Vibrating Compactors, Vibrocompaction methods. Finishing equipment.	**(08 Hrs)**
Unit-IV	**Hoisting & Conveying Equipments:** Hoisting & Transporting equipment; types (Derrick, Tower & Mobile), factors affecting for selection. Conveying equipments-: belt, apron, vibrating, pneumatic, flight & spiral or screw conveyors. Hauling	**(08 Hrs)**

	equipments. Crushers & its types.	
Unit-V	**Equipment Management & Economics:** Planning Process of Equipment. Identification – Selection of Equipment - Maintenance Management. Cost Control of Equipment. Safety Management, Equipment cost -: Ownership cost, Operating Cost, Equipment Life and Replacement Analysis. Depreciation Analysis, Safety Management of equipments.	**(08 Hrs)**
Unit-VI	**Dewatering, Paving Equipments & Concrete Pumps:** Dewatering Techniques; Electro-osmosis method, Well Point System, Paving Equipments; Types, Uses. Asphalt Pavers, Slip Form Pavers, Concrete Pavers. Pumps; Types & Uses. Pumps for concreting.	**(08 Hrs)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III	
Unit Test -2	UNIT – IV,V,VI	

Assignments –

1. Write short notes on -:
   a) Shotcreting
   b) Gunieting
   c) Trenchless technology
   d) Drill & Blast method
   e) Pneumatic drilling equipments

2. Define & differentiate between Cofferdams & Caissons & briefly explain piles & its Classification.
3. List out difference between crawler and pneumatic type of wheels?
4. Compare belt conveyor with other types of conveyors?
5. What are the various equipments used for compacting? Explain them.
6. Explain launching of girders.
7. What are the different types of equipments used for trenching and tunneling?
8. What is Well point system?
9. Describe various methods for tunneling in hard rocks.

Term work - :

1. Collection of pamphlets and information regarding various construction techniques equipment (Information pertaining to the following aspects should be collected)
   i. Types, Different makes of the equipment
   ii. Useful Life and area of use
   iii. Equipment performance data

2. In context of tunneling, enlist and explain different tunnel driving techniques & tunnel boring machines.

3. Classify, discuss briefly various earth work machineries (any five) & factors affecting in selection including their economics.
4. Classify & explain various hoisting & conveying equipment. Discuss in detail about factors affecting in selection of them & its economics.
5. Explain crushers & its types in detail.
6. Enlist & explain with neat diagrams, different dewatering techniques (electro-osmosis method, well point system).
7. Write a brief note on Pumps & its types. Discuss in detail about various pumps used for concreting.
8. Prepare a Power Point presentation (P.P.T.) on any of the topic of your choice from the entire syllabus after getting approval of topic from your subject teacher.
9. Site Visit report to be prepared after visiting the site covering topics mentioned in syllabi.

Textbooks -:

1. Peurifoy, R., Schexnayder, C., Shapira, A., & Schmitt, R. (2011). "ConstructionPlanning, Equipment, and Methods" (8th ed.). McGraw-Hill.
2. Gransberg, D. D., Popescu, C. M., & Ryan, R. C. (2006). "Construction equipment management for engineers, estimators, and owners" (2nd edition). CRC Press.

Reference Books:

1. Mahesh Verma, "Construction Equipment & Planning & Application", Metropolitan Book Company Private Ltd., New Delhi.
2. Peurifoy Robert L., William B. Ledbetter, "Construction Planning Equipment Methods", McGraw Hill Book Company.
3. Russel James E., "Construction Equipment", Reston Publishing Company.
4. Shetty M.S., "Concrete Technology – Theory & Practice", S. Chand & Company Private Limited.
5. S.C. Sharma & Khanna, Construction Equipments & its Management",
6. V.R. Phadke "Construction Machinery & Works Management".
7. Day, D. A., & Benjamin, N. B. H. (1991). "Construction equipment guide" (2ndedition). John Wiley & Sons.
8. Harris, F. (1994). "Modern construction and ground engineering equipment and methods" (2nd ed.). Pearson Longman.
9. Nunnally, S. W. (2011). "Construction methods and management" (8th edition.).Prentice Hall.

Project Based Learning topics - :

1. Construction Technology used in defense war fields.
2. Low cost housing - Construction of a low cost house.

3. Tunnel design.
4. Use of dampers in high rise buildings
5. Construction of Overhead Bridge process. (Case study).
6. The invention of slip form technique and cost savings (case study).
7. PILE Construction Technique.
8. Construction techniques used in Empire State Building and Burj Khalifa.
9. For the construction project what capital cost has to be taken in consideration (Case study)?
10. List out some of the software used in the construction sector to estimate cost and monitoring expenses of machineries and perform one application of it on construction site/project?
11. What are the health and safety duties in relation to concrete pumping work? What is to be involved in managing risks associated with concrete pumping?
12. What are the parameters for Selection of Tunneling Method and Parameters Effecting Ground Settlements
13. How to choose the right conveyor system? How much do conveyor systems cost?
14. Why is electro-osmosis (dewatering) so effective in clayey and heterogeneous soils. Explain with a case study?
15. Explain methods of launching girders at a metro rail site in India.
16. How do real estate development and precast concrete elements fit together? Are there any limitations regarding the construction of houses?
17. Construction of Emergency Temporary structures and facilities (Jumbo COVID hospital etc.).
18. What are the hazards associated with construction of cofferdam?
19. What are the different methods of blasting?
20. Explain Mechanical Dredging Operations for Removal of Reservoir Sediment.

Programme: B. Tech (Civil) Sem – III (2021)

<table>
<tr><td colspan="4" align="center">COURSE: FLUID MECHANICS</td></tr>
<tr><td colspan="2">TEACHING SCHEME:
Theory: 04 Hours / Week</td><td>EXAMINATION SCHEME:
Semester End Examination: 60 Marks
Internal Assessment: 40 Marks</td><td>CREDITS:
Theory: 04</td></tr>
<tr><td colspan="2">Practical: 02 Hours / Week</td><td>Term Work : 25 Marks
Oral : 25 Marks</td><td>Term Work & Oral:
01</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Course Pre-requisites: The students should have knowledge of</td></tr>
<tr><td>1</td><td colspan="3">Engineering Mathematics</td></tr>
<tr><td>2</td><td colspan="3">Engineering Physics</td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td></td><td colspan="3">To make the student understand the scope and application of Fluid Mechanics</td></tr>
<tr><td colspan="4">Course Outcomes: The student will be able to</td></tr>
<tr><td>1</td><td colspan="3">describe basic properties of fluids and measure its properties in static conditions</td></tr>
<tr><td>2</td><td colspan="3">apply knowledge of fluid kinematics and dynamics conditions.</td></tr>
<tr><td>3</td><td colspan="3">analyse physical phenomenon dimensionally</td></tr>
<tr><td>4</td><td colspan="3">explain laminar flow and flow through pipes.</td></tr>
<tr><td>5</td><td colspan="3">explain of boundary layer theory.</td></tr>
<tr><td>6</td><td colspan="3">describe turbulent flow</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td colspan="4">Course Content:</td></tr>
</table>

Unit-I	**Properties of Fluids & Statics** : Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids. Statics: Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height.	**(08 Hrs)**
Unit-II	**Kinematics** Types of flow, path lines and streak lines, stream lines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net.	**(08 Hrs)**
Unit-III	**Energy Relationships** Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, Impulse momentum equation..	**(08 Hrs)**
Unit-IV	**Dimensional Analysis and Model Studies** Dimensional homogeneity, important dimensionless parameters, Dimensional analysis using Buckingham's theorem, Model studies, Similitude, Model laws, Types of models.	**(08 Hrs)**
Unit-V	**Fundamental of Pipe Flow & Boundary layer theory** Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe, Hagen Poisullies Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of	**(08 Hrs)**

	boundary layer, Boundary layer thickness, Velocity distributions within boundary layer	
Unit-VI	**Turbulent flow & Pipe Flow Problems** Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Pipe network Analysis, Siphons, Hydraulic transmission through pipes, three reservoir problems.	**(08 Hrs)**

Internal Assessment:

	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI

Assignments: Students should complete assignments from

1	Solution of numerical problems asked in recent three years of BVU question papers.
2	Solution of questions asked in recent three years BVU question papers
3	Report of new topic being discussed in reputed research journals related to fluid mechanics
4	Mini projects such as collection of information, Brochure, Data, on a topic related to fluid mechanics.
5	Writing of industrial applications of various topics of syllabus.
6	Design of new experiments related to fluid mechanics.
7	Collection of two fluid mechanics NPTEL videos and demonstration of it.
8	Collection of information about fluid mechanics equipment's /machinery/materials related to fluid mechanics.
9	Collection of information about fluid mechanics phenomenon and its explanation.
10	Collection of data of different fluids with reference to their properties.

Term Work: The term-work shall consist of Minimum **Eight** experiments from list below.

1	Determination of Viscosity
2	Study of Pressure Measuring Devices
3	Study of Stability of Floating Bodies
4	Verification of Bernoulli's Theorem.
5	Calibration of C_d of Venturimeter
6	Calibration of C_d of Orifice
7	Calibration of C_d Notch
8	Study of Laminar flow Using Heleshaw's Apparatus
9	Study of Laminar flow Using Reynold's Apparatus
10	Design of Venturimeter (As per IS Code)
11	Design of Weir (As per IS Code)

Oral: The Oral examination will be based on above term work and course content.

Reference Books:

1	Garde R. J. and Mirajgaonkar "Engineering Fluid Mechanics" ScitechPulication
2	C.P.Konthadraman "Fluid Mechanics And Machinery" New Age Publications
3	S. Ramamurtham "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat Rai Publishing Company
4	R. K. Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publications
5	R.K. Rajput "Fluid Mechanics" S Chand Publications

6	Garde R. J. and Mirajgaonkar "Fluid Mechanics Through Problems" , New Age International New Delhi
7	Modi P.N. and Seth S.M. " Fluid Mechanics" Standard Book House
Topics for Project Based Learning for Fluid Mechanics	
1	Determining physical properties of 3 different Fluids. (Specific Weight, Mass Density, specific volume , specific gravity)
2	Determining kinematic viscosity at different temperatures of 3 different fluids (Lubricating oils, Cooking oil,)
3	Collection of Newtonian fluid, non Newtonian Fluid, Ideal Plastics and Thixotropic Fluids one each and studying properties of fluids.
4	Based on pressure density height relationship, prepare a sheet showing water pressure on wall of dam of different heights.
5	Prepare a model of a ship showing different Metacentric heights
6	Prepare a model ship showing stable, unstable equilibrium (C.G. and C.P.)
7	Demonstrate and verify Bernoullies theorem using other equipments (Wind Tunnel, etc.)
8	Collection of information and presentation of working of any hyudraulic equipment (JCB, Earth moving machinery etc.)
9	Calculation of Energy losses in pipe flow for different flow conditions.
10	Calculation of Coefficient of discharge of Venturimeter by taking 10 different flow readings.
11	Calculation of Coefficient of velocity of Venturimeter by taking 10 different flow readings.
12	Calculation of Coefficient of discharge of Notch by taking 10 different flow readings.
13	Preparing different shaped acrylic notches to measure discharge and calibrating it.
14	Calculate Energy losses in domestic pipe line with given data.
15	Preparing a acrylic model for a dam and testing it.
16	Find Metacentric Height of body containing liquid. Discuss the difference with reference to normal case.
17	Prepare a model Orifice Meter device in a UPVC pipe length.
18	Prepare a model of U Tube manometer
19	Prepare a model of U Tube inclined Manometer
20	Prepare a model of U Tube Micromanometer

Programme: B. Tech (Civil) Sem – III (2021)

<table>
<tr><td colspan="3">COURSE: ECONOMICS & FINANCE</td></tr>
<tr><td>TEACHING SCHEME:
Theory: 03 Hours / Week</td><td>EXAMINATION SCHEME:
Semester End Examination: 60 Marks
Internal Assessment: 40 Marks</td><td>CREDITS:
Theory:03</td></tr>
</table>

Course Pre-requisites: The students should have knowledge of		
1	Construction Design & Drawing	
2	Basic Mathematics	
Course Objective:		
	To make students understand engineering economics and financial management.	
Course Outcomes: The student will be able to		
1	explain the concept of Engineering Economics.	
2	estimate time value of money.	
3	select best project.	
4	find out depreciation cost.	
5	prepare balance sheet.	
6	generate finance for organization.	
Course Content:		
Unit-I	**Engineering Economics:** Introduction,Definition of Economics, Importance of Engineering economics, basic economics concept-Human wants. Utility, value, cost, price, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labour, capital and organization	**(06 Hrs)**
Unit-II	**Cash Flow:** Basic principles, time value of money, cash flow diagram. Equivalence single payment in the future, present payment compare to uniform series payment. Future payment compare to uniform series payment.	**(06 Hrs)**
Unit-III	**Project Economics and Analysis:** Comparison of alternatives, net present value present, future and annual worth method of comparing alternatives, internal rate of return. Break even analysis. Benefit cost ratio	**(06 Hrs)**
Unit-IV	**Depreciation and Value Engineering:** Depreciation and methods of depreciations. Inflation, value engineering and value analysis	**(06 Hrs)**
Unit-V	**Financial Management:** Financial management, construction accountancy charts of accounts, financial statement, profit and loss account, balance sheet of construction Industry.	**(06 Hrs)**
Unit-VI	**Project Budgeting**: Types of capitals, fix and working capital, debentures, shares, public deposits. Forms of foreign capital, money and capital market in India. New economic policy. Role of financial institutions in economic development,	**(06 Hrs)**

Internal Assessment:		
	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV,V,VI

Assignments: Students should complete assignments from

1	Preparation of cash flow diagrams and finding out time value of money
2	Comparison of different projects by different methods
3	Benefit cost analysis of project
4	Determination depreciation value of equipment
5	Preparation of balance sheet for project
6	Assignment on value analysis
7	Numerical on engineering economics

Reference Books:

1	Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998
2	Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.
3	Boyer, C. B. and Merzbach, U. C., "A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989
4	Gould, F. E., "Managing the Construction Process", 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.
5	Gransberg, D. G., Popescu, C. M. and Ryan, R. C., "Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.
6	Harris, F. ,McCaffer, R. and Edum- Fotwe, F., "Modern Construction Management", 6th ed., Blackwell Publishing, 2006.
7	Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2011.
8	Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., "Engineering Economic Analysis", Oxford University Press, 2010
9	Ostwald, P. F., "Construction Cost Analysis and Estimating", Prentice Hall, Upper Saddle River New Jersey, 2001
10	Peterson, S. J., "Construction Accounting and Financial Management", Pearson Education Upper Saddle River, New Jersey, 2005

Topics for project-based Learning for Economics and finance.

1. The impact of fiscal deficit on economic performance in developing countries. A case study of India.
2. The effect of taxation on the Indian economic growth.
3. Privatization of public enterpriser and its implication on economic policy and development.
4. The impact of capital market on the economic growth in India.
5. The role of Indian stock exchange in industrial development.
6. The impact of foreign direct investment on the Indian economy.
7. Foreign direct investment and employment generation in India.

8. The role of small business in poverty alleviation.
9. Demand and its determinants.
10. Working capital management.
11. Infrastructure and economic development.
12. Project on supply and its determinants.
13. Depreciation
14. Project selection methods.
15. Time value of money
16. Financial management.
17. New economic policy of India.
18. Forms of foreign capitals.
19. Instrument in capital market (shares).
20. Money Market.

Programme: B. Tech. (Civil) Sem – III (2021)

COURSE: CONCRETE TECHNOLOGY		
TEACHING SCHEME: Theory: 04 Hours / Week	**EXAMINATION SCHEME:** Semester End Examination: 60 Marks Internal Assessment: 40 Marks	**CREDITS:** Theory :04
Practical: 02 Hours / Week	Term Work: 25 Marks Oral: 25 Marks	TW & OR: 01

Course Pre-requisites: The students should have knowledge of

1	Building Materials
2	Fundamentals of Civil Engineering

Course Objective:

	The student should know qualities & properties of concrete.

Course Outcomes: The student will be able to

1	test ingredients of concrete
2	measure workability of concrete.
3	measure strength of hardened concrete.
4	describe durability of concrete
5	apply special concreting techniques
6	design of concrete mix

Course Content:

Unit-I	**Constituent of Concrete:** **Cement -** Chemical composition, hydration, heat of hydration, hydrated structure, types of cement, testing of cement as per Indian standard. **Aggregates -** Utility in concrete, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand, deleterious substances, sieve analysis, various grading, and grading requirements, sampling & testing as per Indian Standards. **Water -** General Requirements & limiting values of impurities.	**(08 Hrs.)**
Unit-II	**Fresh concrete:** Methods of mixing, transporting, and placing of concrete. Workability – Definition and requirement, factors affecting workability, various tests as per IS and ASTM. Segregation and bleeding, stiffening, re-tempering. Curing: necessity and various methods, micro-cracking. Admixture for concrete.	**(08 Hrs.)**
Unit-III	**Hardened concrete:** Compressive and tensile strength and their relationship, tests as per IS and ASTM. **Factors affecting strength –** water cement ratio, gel space ratio, aggregate cement ratio, properties of ingredients, effect of age, maturity, aggregate cement-paste inter-face, various finishes of concrete. Introduction to aspects of elasticity, shrinkage, and creep. **Tests for strength of concrete**: Destructive, semi destructive, and non-destructive tests with their limitations, test methods as per IS Code.	**(08 Hrs.)**

Unit-IV	**Durability and permeability of concrete:** Definitions, causes, carbonation, cracking **Concrete in Aggressive Environment:** Alkali – Aggregate Reaction, Sulphate Attack, Chloride Attack, Acid Attack, Effect of Sea Water, Special Coating for Water Proofing, Sulphate Chloride and Acid Attack.	**(08 Hrs.)**
Unit-V	**Special Concrete:** Behavior and characteristics of high strength concrete, High Performance Concrete, Fiber Reinforced Concrete, Mass Concreting, Light Weight Concrete, and Concrete for Precast. **Special concreting techniques:** Pumped concrete, concrete, underwater concrete, pre-placed concrete, vacuum dewatered concrete, hot and cold weather concreting, Ready mixe concrete.	**(08 Hrs.)**
Unit-VI	**Concrete Mix Design:** Principles of Mix Proportioning, Probabilistic Parameters, Factors Governing Selection of mix. IS Method of Concrete Mix Design, Variability of Test Results, Acceptance Criteria, Various IS Code Provisions.	**(08 Hrs.)**

Internal Assessment:

	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI

Assignments: Students should complete assignments from

1	Assignment based on Unit- I
2	Assignment based on Unit- II
3	Assignment based on Unit- III
4	Assignment based on Unit- VI
5	Assignment based on Unit- V
6	Assignment based on Unit- VI

Term Work: The term-work shall consist of from list below.

A	**Test on Aggregate (Minimum 4)**
1	Moisture content, Water Absorption
2	Specific Gravity of Aggregate
3	Fineness Modulus of Aggregate
4	Aggregate Impact Test
5	Aggregate Crushing Test
6	Flakiness Index, Elongation Index
B	**Test on Cement (Minimum 3)**
1	Fineness of Cement
2	Standard consistency and Setting time of Cement.
3	Compressive strength of Cement
4	Soundness of Cement
C	**Tests on Concrete (Minimum 3)**
1	Effect of admixture on workability of concrete
2	Compressive Strength of Concrete
3	Flexural strength of concrete

4	Rebound Hammer Test
Oral: The Oral examination will be based on above term work and course content.	
Reference Books:	
1	M S Shetty; ‘Concrete Technology’, S. Chand Publication New Delhi
2	P Kumar Mehta, ‘Monteiro; Concrete Technology’, Indian Concrete Institute
3	A. M. Neville; ‘Properties of Concrete’, Pearson Education
4	A R Santhakumar; ‘Concrete Technology’, Oxford University Press
5	M L Gambhir; ‘Concrete Technology’, Tata McGraw Hill
6	IS 456-2000 Indian Standard Plain and Reinforced Concrete - Code of Practice
7	IS 269-1989 Indian Standard Ordinary Portland Cement, 33 Grade — Specification
8	IS 516-1959 Indian Standard Methods of Tests For Strength of Concrete
Topics for Project based learning:	
1.	Market survey, report writing and cost analysis to select types of cements for various construction works.
2.	Site visit to RMC plant (nearby), observations, records and field test of cement.
3.	Conduct various tests as per IS in laboratory on aggregates with reference to syllabus
4.	Site visit to under construction to collect detail information about the ingredients of concrete mix.
5.	Market survey, report writing and cost analysis of Aggregates for various construction works.
6.	Write report on Principal concrete properties affected by the properties of aggregates
7.	Writing complete report and procedure of fresh concrete.
8.	Site visit to nearby RMC plant and draw flow chart.
9.	Conduct various tests on workability of Concrete with reference to syllabus.
10.	Site visit to under construction to observe the quality of fresh concrete.
11.	Market survey of various admixtures used in fresh concrete and writing proper report on each admixture.
12.	Report writing and tests on different grades of concrete.
13.	Report writing and non-destructive tests on hardened concrete of different types.
14.	Preparing Report on all types of Destructive Test conducted in Laboratory.
15.	Report on conducting various tests on Durability and Permeability of Concrete.
16.	Report writing and tests on effect on concrete of Aggressive Environment.
17.	Report on use of different types of admixtures on different grades of concrete.
18.	Site visit and market survey report writing on Special type of Concreting.
19	Report writing on effects of Mix Design on Special Concreting.
20	Preparation of Mix Design for Special Type of Concrete and visiting site and getting all information of mix design used on actual site.

Programme: B. Tech. (Civil) Sem – III (2021)

COURSE: Vocational Course-I : AUTOCAD 3D		
TEACHING SCHEME: Practical: 02 Hours / Week	**EXAMINATION SCHEME:** Term Work: 25 Marks Oral: 25 Marks	**CREDITS:** TW&OR :01

Course Pre-requisites: The students should have knowledge of	
1	Building Planning and Design
2	Proficiency in producing 2D drawings in AutoCAD
Course Objective:	
	The student should be able to prepare 3D models of construction projects
Course Outcomes: The student will be able to	
1	draw various Engineering drawing using AutoCAD 3D
2	draw various 3D elements of a building from 2d profiles.
3	draw various 3D elevation and sections of the building.
4	draw and explain various modelling concepts of building construction and building drawing by using AutoCAD 3D.
5	draw using different types of materials
6	Render 3D models and scale printing of 3D models

Course Content:

Unit-I	**Introduction to 3D Modelling:** Introduction to AutoCAD 3D, Creating solid primitives, Mesh primitives Working in 3D, Commands for Editing in AutoCAD 3D	**(4 Hrs)**
Unit-II	**Modelling Workflow:** Creating models from 2D profiles, Creating composite models	**(4 Hrs)**
Unit-III	**Editing Models:** Adding detail to your solid models, Editing solid models-Walls, Windows, Door etc	**(4 Hrs)**
Unit-IV	**Visualization:** Using visual styles, Using lights for Different view angles	**(4 Hrs)**
Unit-V	**Visualization:** Using materials for different Items- Walls, Flooring, Door, Windows, Paints etc.	**(4 Hrs)**
Unit-VI	AutoCAD 3D Model Rendering Process, Scale Printing of 3D Models in AutoCAD	**(4 Hrs)**

Term Work: The term-work shall consist of -

1	Preparation of 3D solid Primitives & Mesh Primitives
2	Preparation of 3D models from 2D profiles
3	AutoCAD 3D Drawing of a plan, elevation, and section of small building.
4	Preparation of AutoCAD 3D views of small building.
5	Use of different Materials for Items.
6	3D Model rendering & Scale Printing of models.

Oral: The Oral examination will be based on above term work and course content.	
Reference Books:	
1	Goerge Omura “Mastering AutoCAD 2018 and AutoCAD LT 2018, Sybex
2	James A. Leach “AutoCAD 2018 Instructor perfect paperback,SDC Publications
3	Cheryl R. Shrock “Beginning AutoCAD Exercise workbook 2018,Industrial Press Inc., U.S.
4	James A. Leach , Shawna Lockhart, “AutoCAD 2018 Instructor”, SDC Publications

Programme: B. Tech. (Civil) Sem – IV (2021)

Course: Vector Calculus and Differential equations		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 4 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 4

Course Pre-requisites: The students should have knowledge of	
1	differentiation, integration, and differential equation
2	basic knowledge of vector algebra
Course Objectives:	
	To form mathematical model and solve mathematical problem in Civil Engineering
Course Outcomes: The student will be able to	
1	Form mathematical modelling of systems using differential equations and solve the differential equations
2	Apply mathematical modeling to physical systems using ordinary differential and evaluate particular solution.
3	Apply mathematical modeling of systems using partial differential equations and solve the partial differential equations
4	Apply Vector differentiation and integration that finds applications in solid mechanics, fluid flow, heat problems and potential theory etc.
5	Apply vector integral calculus to solve various problems in Civil Engineering.
6	Analyze the numerical data by applying statistical methods
Course Content:	

UNIT - I	**Linear Differential Equations (LDE)** Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE.	**(06 Hrs.)**
UNIT - II	**Applications of DE** Modeling of problems on bending of beams, whirling of shafts and mass spring systems. Applications of ODE to problems of Civil and allied engineering	**(06 Hrs.)**
UNIT - III	**Applications of PDE** Solution of Partial Differential Equations (PDE): Wave equation , 1D and 2D-Heat equation by using Separation of variables, Applications of PDE to problems of Civil and allied engineering	**(06 Hrs.)**
UNIT - IV	**Vector Differential Calculus)** Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities	**(06 Hrs.)**
UNIT - V	**Vector Integral Calculus**	**(06 Hrs.)**

	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli's equations	
UNIT - VI	**Statistics and Probability** Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates. Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial, Poisson, Normal and Hypergeometric; Test of Hypothesis: Chi-Square test.	**(06 Hrs)**

Unit Tests:
Unit Test I: Unit I to Unit III
Unit Test II: Unit IV to VI

Textbooks:

1. Peter V. O'Neil Advanced Engineering Mathematics by (Cengage Learning).
2. Erwin Kreyszig Advanced Engineering Mathematics by (Wiley Eastern Ltd.).

Reference Books:

1. B.V. Raman Engineering Mathematics by Tata McGraw-Hill.
2. M. D. Greenberg Advanced Engineering Mathematics, 2E, by Pearson Education
3. Wylie C.R. & Barrett L.C. Advanced Engineering Mathematics, McGraw-Hill, Inc.
4. B. S. Grewal Higher Engineering Mathematics by Khanna Publication, Delhi.
5. P. N. Wartikar & J. N. Wartikar Applied Mathematics Volumes I and II Pune Vidyarthi Griha Prakashan, Pune

Project Based learning topics for Vector Calculus and Differential equations:-
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable

1. Method of variation of parameters
2. Cauchy's linear differential equation
3. Legendre's linear differential equation
4. Bending of beam
5. Mass spring system
6. Wave equation
7. One dimensional heat equation
8. Laplace equation
9. Directional derivative
10. Curl and divergence
11. Work done
12. Gauss divergence theorem
13. Stokes theorem
14. Central tendency
15. Measures of dispersion
16. Skewness and kurtosis
17. Theoretical probability distributions

Programme: B. Tech. (Civil) Sem – IV (2021)

Course: Open Channel Flow and Hydraulic Machinery

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 04 Hours / Week Tutorial: 02 Hours/week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work: 25 Marks Oral: 25 Marks	Theory: 04 Term work & Oral :01

Course Pre-requisites: The students should have knowledge of

1	Fluid Mechanics basics, Types of flows, friction.
2	Basic knowledge of Water retaining structure like dam, weir etc. irrigation channel.
3	Basic knowledge of Drag & lift, unsteady flow.
4	Basic knowledge of Hydro power plant.
5	Basic knowledge of pumps.

Course Objective:

To impart knowledge of open channel flows and hydraulic machinery to students.

Course Outcomes: The student will be able to

1	Design most efficient channel section, find critical depth of a flow.
2	Understand and apply knowledge of various flow profile and their characteristics.
3	Find energy dissipated in a hydraulic jump.
4	Calculate forces on vanes for different conditions.
5	Understand and apply knowledge of turbines.
6	Understand and apply knowledge of pumps.

Course Content:

UNIT - I	**Uniform Flow in Open Channels** Basic Equations: Continuity Equation, Bernoulli's Equation, & Momentum Equation as applied to open channel one dimensional flow, Velocity distribution in open channel, Chezy's & Manning's formulae, factors affecting Manning's roughness coefficient, Normal depth, Conveyance Section factor, Most efficient channel section, Specific Energy, Specific Energy diagram, Depth-Discharge diagrams, alternate depths, Critical depth, Critical slopes, Froude number, Specific Force, Specific force diagrams, Conjugate depths, Depth-Discharge diagrams with respect to specific force.	**(08Hrs)**
UNIT - II	**Gradually Varied Flow in Open Channels** Gradually and rapidly varied flows, their examples, Basic assumptions in the derivation of GVF, Differential equations of GVF, Various GVF profiles, and their characteristics, Computations of GVF	**(08Hrs)**
UNIT - III	**Rapidly Varied Flow** Hydraulic Jump in Rectangular and Trapezoidal channels, Classification & Practical uses of Jump, Examples of occurrence of Hydraulic Jump, Conjugate Depths, Energy Dissipation in Hydraulic Jump, Location of Jump, Non Contact Flow measurement Devices for measurement of velocity and discharge in open Channels, Methods Stream gauging	**(08Hrs)**
UNIT - IV	**Unsteady Flow** Types, Flow through openings under varying head, Flow Compressibility, Celerity of Elastic Pressure Waves, Water Hammer Phenomenon, Rigid & Elastic water Columns Theories, Simple cases neglecting Friction, rapid acceleration of flow due to sudden opening of valve, surge tanks and their functions, Location and	**(08Hrs)**

	Classification. Fluid Flow around Submerged Bodies: Practical problems involving fluid flow around submerged bodies, Definition & Expression for Drag, lift, drag coefficient, Types of Drag.	
UNIT - V	**Impact of Jet and Turbines** Impact of Jet: Force Exerted due to impact of jet on stationary and moving flat and curved plates using linear momentum Principle, Principle of angular momentum, Euler's Momentum Equation for Turbines. Element of Hydropower plant, Hydraulic turbines, Heads & efficiencies, Governing of turbines, Design of Pelton Wheel, Cavitations in turbines, Performance of turbines, Prediction of performance in terms of unit quantities and specific quantities, specific speed.	**(08Hrs)**
UNIT - VI	**Centrifugal Pump** Theory of centrifugal pump, Centrifugal head due to rotation, Heads & efficiencies, .Design of Pumps Cavitations, Prediction of performance in terms of specific quantities, specific speed, characteristic curves.	**(08Hrs)**

Internal Assessment:

	Unit Test -1	UNIT – I to III
	Unit Test -2	UNIT – IV to VI

Assignments (Any Six)

1	Solve Four Numerical to find out Critical Depth.
2	Solve Numerical on GVF to find out flow profiles
3	Solve Numerical on Hydraulic Jump to find out dissipation of energy.
4	Solve Numericals to find out forces on different types of vanes.
5	Solve Numericals on design of Turbines.
6	Solve Numericals on design of Pumps.
7	Collection & Study of Information Brochure about different Hydraulic Machineries.
8	Collection & Study of Information Brochure about Hydraulic Lab Supply Companies
9	Solve Numericals of Drag & Lift

Term Work (Any Eight)

1	Flow around aerofoil.
2	Flow around a Circular Cylinder.
3	Impact of jet around flat / curved plate.
4	Performance Curves of Hydraulic Turbine. Constant Head Characteristic Curve
5	Characteristics of Centrifugal Pump.
6	Uniform flow formulae of open channel.
7	Velocity distribution in open channel flow
8	Hydraulic jump as energy dissipater
9	Characteristics of various GVF profiles
10	Design of Hydraulic Centrifugal Pump
11	Design of Hydraulic Turbine.
12	GVF Computations by Direct Step Method
13	Site Visit

Oral: The Oral examination will be based on above term work and course content.

Text Books:

1	Garde R. J., Mirajgaonkar A. G., "Engineering Fluid Mechanics", Scitech Publication, Chennai
2	Rangaraju K. G., "Open Channel Flow", Tata McGraw Publication
3	Streeter Wylie, "Fluid Mechanics", Tata McGraw Publication
4	Subramanyam K., "Open Channel Flow", Tata McGraw Publication
5	Ven Te Chow, "Open Channel Hydraulics", Tata McGraw Publication
6	Zoeb Husain, Zanial Alimuddin, "Basic Fluid Mechanics and Hydraulic Machines" BSP Books Pvt. Ltd.
Reference Books	
1	Fox, McDonald, Pritchard, "Fluid Mechanics SI Version" Willey Student Edition
2	Frank M. White, "Fluid Mechanics", McGraw Hills Series
3	C P Konthadraman, R Roodramoorthy, "Fluid Mechanics & Machinery" New Academic Science
Topics for Project Based Learning for Open Channel Flow and Hydraulic Machinery	
1	Prepare a model of Undershot wheel
2	Prepare a model of turbine with curved blades
3	Prepare a model of orifice meter in UPVC pipe
4	Prepare a model of Symmetric aerofoil and test it
5	Prepare a model of asymmetric aerofoil and test it.
6	Prepare a model of Prepare a model of reaction turbine.
7	Prepare a model with hemispherical cups
8	Prepare a smoke to visualize flow pattern around the aerofoil.
9	Prepare a aerofoil model wrapped with cotton fibers around it to visualize turbulent flow in wind tunnel.
10	Prepare a model of Venturimeter conforming to standards.
11	Prepare a flat plate and curved vane (outside) model to be tested in Impact of Jet Apparatus.
12	Prepare a U tube manometer
13	Prepare a U tube inclined manometer
14	Prepare a U tube micro manometer
15	Prepare a Inverted U tube manometer
16	Prepare a detailed drawing for making hydraulic bench consisting of Venturimeter, orifice meter, and head loss through pipe fittings experiments.
17	Locate separation point of an aerofoil experimentally.
18	Locate separation point of a cylinder experimentally.
19	Calculate head loss for a centrifugal pump in water supply use.
20	Compare the drag forces on various shapes experimentally (Sphere, plate, etc)

Programme:B. Tech. (Civil) Sem – IV 2021

Course: Geomechanics		
TEACHING SCHEME: Theory: 04 Hours / Week	**EXAMINATION SCHEME:** Semester End Examination: 60Marks Internal Assessment: 40Marks	**CREDITS:** Theory:04
Practical: 02 Hours / Week	Term Work: 25 Marks Oral: 25 Marks	TW & OR:1

Course Pre-requisites: The students should have knowledge of	
1	Statics and Dynamics
2	Mathematics
3	Fluid mechanics
Course Objective:	
	To make student capable to determine the index and engineering properties of soil and use of soil as a construction material.
Course Outcomes: The student will be able to	
1	identify and classify the soil according to formation of soil and its properties.
2	determine index properties of soil.
3	calculate coefficient of permeability and effective stresses of soil.
4	calculate the geostatic stresses and OMC of soil by various methods.
5	analysis of shear parameters of soil by various method.
6	compute lateral earth pressure on retaining wall.

Course Content:

UNIT – I	**Introduction of Geomechanics and soil classification**	**(08Hrs)**
	Introduction to Geomechanics Engineering and its applications to Civil Engineering, Types of soil structure, Field identification of soils basic definitions, three and two phase system of soil, soil classification systems – USCS, IS, HRB, Textural classification, Activity of clay, Sensitivity of clay, Thixotrophy of clay	
UNIT - II	**Index Properties of Soil**	**(08Hrs)**
	Index properties of soil – Water content, specific gravity, particle size distribution, Consistency limits, density, relative density, Relationship between index properties of soil.	
UNIT - III	**Permeability and Seepage**	**(08Hrs)**
	soil water, permeability-Basic Definition, Darcy's law, factors affecting permeability. Laboratory measurement of permeability: Constant head method and Falling head method as per IS 2720. Total, Neutral and effective stress-principle of effective stress, head gradient and potential, seepage pressure, Upward flow condition, 2 D flow, Laplace equation, flow net:- Characteristics and uses.	
UNIT - IV	**Compaction and Stress Distribution**	**(08Hrs)**
	Compaction: - Laboratory compaction tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Field compactions equipments Stresses in soil: Geostatic Stresses, stress distribution, Bossinsque's	

	Theory for point load, Westergaard's theory	
UNIT - V	**Shear Strength of Soil**	**(08Hrs)**
	Introduction- Shear strength an Engineering Property. Mohr's stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strain behaviour of sands and clays Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests.	
UNIT - VI	**Earth Pressure**	**(08Hrs)**
	Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory : Earth pressure on Retaining wall due to submerged backfill. Backfill with uniform surcharge, backfill with sloping surface, layered backfill.	
Internal Assessment:		
	Unit Test 1 — **Unit I to III**	
	Unit Test 2 — **Unit No IV to VI**	
Assignments:		
1	Study of various relationship between weight and volume, numerical based on it and classification of soil	
2	Study of determination of different index properties of soil and numerical based on it.	
3	Study of permeability and numerical based on it.	
4	Study of compaction of soil and numerical based on it.	
5	Determination of shear parameter of soil by various methods and numerical based on it.	
6	Numerical problem based on calculation of lateral earth pressure on retaining wall.	
Term Work:		
	The term-work shall consist of minimum **Eight** experiments from list below, out of which **first four are compulsory**.	
1	Determine water content of given soil sample by oven drying method	
2	Determine specific gravity of given soil by pycnometer method	
3	Determine of consistency limits of soil – Liquid, plastic and shrinkage limit.	
4	Determine the shear parameters of given soil by Direct shear test.	
5	Determine dry unit weight of soil in field by core cutter or sand replacement method.	
6	Determine co-efficient of permeability by constant head test or falling head test of given soil sample.	
7	Determine MDD and OMC by standard proctor test and Modified proctor test of given soil sample.	
8	Determine grain size distribution of given soil sample by mechanical sieve analysis.	

9	Determine the shear parameters of given soil by Unconfined Compression Strength of soil.	
10	Determine the shear parameters of given soil by Triaxial Shear Test	
11	Determine the shear parameters of given soil by Vane Shear Test	
Oral/Practical:		
	The oral examination based on above term work.	
Reference Books:		
1) Punmia B.C., "Soil Mechanics and Foundation Engineering" Laxmi Publications		
2) K. R. Arora, " Soil Mechanics & Foundation Engineering,		
3) C. Venkatramaiah, "Geotechnical Engineering", New Age International Publishers		
4) Das, B.M., "Principles of Geotechnical Engineering", Thomson Asia		
5) Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers.		
6) Joseph E. Bowels, "Soil mechanics and Foundation Engineering", Tata McGraw Hill Publications Company, New Delhi		
Topics for project based learning for Geomechanics		
1.Prepare the chart of different classification of soils.		
2. Collection the information about soil deposits in various regions of India and show in the map of India		
3. Prepare the chart of different types of soil structure.		
4. Calculate the water content and specific gravity of soil (take at least three different soil sample)		
5. Calculate the consistency limit and flow index of soil (take at least three different soil sample)		
6. Prepare chart showing all basic index properties of soil.		
7.Draw the particle size distribution curve for soil by using excel (take at least two different soil sample)		
8. Prepare the chart for relationship between index properties of soil.		
9. Compare the constant head and falling head method.		
10. Prepare the chart for soil water and permeability of soil.		
11. Draw the flow net for sheet pile or earthern dam.		
12. Compute the permeability of stratified soil deposits by using excel.		
13. Prepare the chart of derivation of Laplace equation for two-dimensional flow.		
14. Compare the standard proctor and modified proctor test.		
15. Collection of information and photographs of machines used for compaction of soil.		
16. Draw the optimum moisture curve for compaction of soil by using excel.		
17. Draw the Mohr's stress circle for triaxial shear test and unconfined compression test.		
18. solution of problems on shear strength parameter by using graphical method. (At least three problem).		
19. Prepare the chart showing lateral earth pressure distribution diagram on retaining wall in various conditions.		
20. Contribution of various scientists in estimation of active and passive earth pressure on retaining wall.		

Programme : B.Tech (Civil) Sem – IV (2021)

COURSE: ANALYSIS OF DETERMINATE STRUCTURES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hours / Week Tutorial: 01 Hour / Week	Semester End Examination: 60 MarksInternal Assessment: 40 Marks	Theory: 03 Tutorial: 01

Course Pre-requisites: The students should have knowledge of

1	Statics and Dynamics
2	Mechanics of Solids

Course Objective:

The student should be able to calculate member forces and deflection of determinate beams, trusses and arches.

Course Outcomes: The student will be able to

1	Determine degree of indeterminacy of structures.
2	Deflection of joints of determinate truss.
3	Construct Influence line diagram for forces in beams.
4	Calculate maximum forces in beams using Influence line diagram.
5	Calculate maximum forces in truss member using Influence line diagram.
6	Calculate forces in three hinged arch.

Course Content:

Unit-I	**Basic Concepts** Classification of structures, Types of structures, skeletal structures; members and member forces, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beams and frames.	**(06 Hrs)**
Unit-II	**Strain Energy and Deflection of Truss** Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axial force, shear force, bending moment and torsional moment. Deflection of joints of determinate truss using Castigliano's first theorem	**(06 Hrs)**
Unit-III	**Influence Line Diagrams for beams:** Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. Muller-Breslau's principle and its application to above beams.	**(06 Hrs)**
Unit-IV	**Application of Influence Line Diagrams for rolling loads on beams:** Rolling loads - Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values	**(06 Hrs)**
Unit-V	**Influence Line Diagrams and its application for truss:** Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.	**(06 Hrs)**

Unit-VI	**Analysis of Three Hinged Arch** Concept and types of arches, Three hinged arches – analysis, Calculation of horizontal Thrust, Radial Shear, Normal Thrust and BM at a cross section.	**(06 Hrs)**

Internal Assessment:

	Unit Test -1	UNIT – I, II, III	
	Unit Test -2	UNIT – IV, V, VI	

Assignments:

Students should complete assignments from

1. Draw different types of structures - space, plane, trusses, beams and frames
2. Draw deflected shapes of different types of structures.
3. Calculate degree of static indeterminacy.
4. Calculate degree of kinematic indeterminacy.
5. Calculate deflection of truss using Castigliano's first theorem.
6. Draw ILD for beams for reaction, SF and BM
7. Calculate maximum SF & BM due to moving loads on beam.
8. Draw ILDs for members of the Truss
9. Calculate maximum axial force in truss due to moving loads.
10. Analyse of three hinged arch

Reference Books:

1	Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication
2	Aslam Kassimali, “Structural Analysis”, Cengage Learning.
3	Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication
4	Bhavikatti S.S., “Structural Analysis- I and II”, Vikas Publication.
5	Pandit G. S. & Gupta S. P., “Theory of Structures Vol-I and Vol-II”, Tata McGraw Hill Publication
6	Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company
7	Prakash Rao D. S., “Structural Analysis”, Universities Press Publication
8	Menon Devdas “Structural Analysis”, Alpha Science International Publication.
9	Khurmi R.S. “Theory of Structures”, S. Chand Publication

Topics for Project Based Learning:

1	Make model of different types of supports
2	Make model of different types of structure
3	Prepare PPT on different types of structures - space, plane, trusses, beams and frames
4	Prepare chart for different types of structures - space, plane, trusses, beams and frames
5	Make model of beam and frame with different types of supports
6	Prepare animated PPT to show deflected shapes of different types of structures.
7	Prepare PPT on degree of static indeterminacy
8	Prepare PPT on degree of kinematic indeterminacy
9	Make skeletal model of truss
10	Analyse truss using software.
11	Prepare PPT on deflection of truss
12	Prepare PPT on ILD of truss

13	Prepare chart on ILD of truss
14	Draw an ILD of truss using software
15	Prepare PPT on ILD of beams
16	Prepare chart on ILD of beams
17	Draw an ILD of beams using software
18	Make model on Muller-Breslau's principle
19	Make model of three hinged arch
20	Prepare PPT on analysis of three hinged arch
21	Prepare chart on analysis of three hinged arch

Programme: B. Tech. (Civil) Sem – IV (2021)

Course: Planning & Management of Construction Projects

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
Practical: 02 Hours / Week	Term Work: 25 Marks Oral: 25 Marks	TW & OR: 1

Course Pre-requisites: The students should have knowledge of	
1	Building Construction.
2	Building Planning and Design
Course Objective:	
	To prepare the student to analyze the network and monitor and control the civil engineering projects.
Course Outcomes: The student will be able to	
1	prepare organization chart.
2	Explain bar charts and elements of network
3	prepare a network and analyze by CPM and PERT methods.
4	update network and carryout resource allocation
5	carry out material management
6	check quality parameters in construction process.

Course Content:

UNIT – I	**Project Management:** Basics of Management, Modern scientific management (Contribution by Fayol, F.W. Taylor, Mayo) Importance, Objectives and functions of Management, Importance of organizational structure, types of organizations, Site Layout.	**(08 Hrs)**
UNIT - II	**Planning & Scheduling:** Work breakdown structure, Introduction to Gantt /Bar Charts and its limitations, Milestone Charts, Development of Network Problems, Elements of Network-Event, Activity, Dummy, Types of Networks, Network Rules **Microsoft Office Project:** Introduction to MS Project	**(08 Hrs)**
UNIT - III	**Network Analysis**: Critical Path Method (CPM), Types of Floats, Program Evaluation, and Review Technique (PERT), Time Computations, Slack.	**(08 Hrs)**
UNIT - IV	**Project Monitoring & Control** Resource Allocation, Resource Smoothening and Leveling, Crashing of Network, Direct Cost and Indirect Cost, Cost Slope, Updating of Network.	**(08 Hrs)**
UNIT - V	**Material Management:** Objectives of material management, material requirement, scheduling, monitoring, inventory control, inventory classification, inventory management, inventory models, economic order quantity, ABC analysis.	**(08 Hrs)**
UNIT - VI	**Total Quality Management:**	**(08 Hrs)**

	Importance of Total Quality Management in Construction Process and Steps Involved, Concept of Quality Control, Quality Assurance, Quality Management and TQM, Six Sigma Concept. **MIS**-Introduction, Necessity of in Management	

Syllabus for Unit Test:

Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

Term Work: The term-work shall consist of -

1) Assignment on different types of organization and their flowcharts.
2) Assignment on bar chart and milestone chart.
3) Assignments on CPM.
4) Assignments on PERT.
5) Assignment on crashing of network.
6) Assignment on updating of network.
7) Assignment on MS Project.
8) Mini Project- Preparation Network and analysis for a building construction project and finding out different types of floats.

Oral:

The Oral examination is based on above term work and course content.

Reference Books:

1. Construction Engineering and Management by S. Seetharaman, Umesh Publications, New Delhi.
2. PERT & CPM principles & applications by L.S. Srinath, affiliated East West press Pvt. Ltd., New Delhi.
3. Project Planning & control with PERT & CPM by Dr. B.C. Punmia, K.K. Khandelwal, Laxmi Publications (P) Ltd, New Delhi.
4. Construction Project Management Planning, Scheduling, and controlling by K.K. Chitkara TMH Publishing Company, New Delhi
5. Civil Engineering Project Management by Alan C. Twort& J. Gordon Rees, Elsevier
6. Project Planning, Analysis selection, Implementation & Review by Prasanna Chandra, Tata McGraw Hill, New Delhi

Topics for Project Based Learning:

1.	Prepare a detailed site layout for any one type of Constriction project.
2.	Prepare a detailed Organizational Structure for at least two types of Projects.
3.	Prepare two detailed Projects in Microsoft Office Project.
4.	Prepare a work breakdown structure for two different type of construction projects.
5.	Prepare two detailed bar charts for any type of construction Project.
6.	Prepare a detailed Milestone chart for Infrastructure project.
7.	Prepare a detailed project analysis using Critical Path Method for two different Projects.
8.	Prepare a detailed project analysis using Program Evaluation and Review Technique for two different types of research projects.
9.	Prepare a detailed report on use and application of time computation in network analysis for construction projects.

10.	Prepare a detailed report on the benefit of use of different types of Floats on Critical Path Method for analysis of construction projects.
11.	Prepare a detailed report on resource allocation in two different types of Construction Projects.
12.	Prepare a detailed report on use of resource smoothing and levelling on construction projects.
13.	Prepare a report on Crashing of Network for Construction Projects with use of Direct cost, Indirect Cost and Cost slope.
14.	Prepare a report on controlling of raw material and work in progress inventory for a construction project.
15.	Prepare a report on use of Inventory Models in Construction Projects.
16.	Prepare a project report on use of inventory control and classification for different types of construction projects.
17.	Prepare a detailed report on Importance on application of Total Quality Management for different types of Construction Projects.
18.	Prepare a report on use of Six Sigma Concept in Construction Projects.
19.	Prepare a report on necessity and use of MIS in Construction Management.
20.	Prepare a report on necessity and use of Quality Control and Quality Assurance for different construction projects.

<table>
<tr><td colspan="3">B. Tech. (Civil) –Sem IV -2021 Course
Plumbing Engineering</td></tr>
<tr><td><u>TEACHING SCHEME:</u></td><td><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS ALLOTTED:</u></td></tr>
<tr><td>Practical: 02 Hours / Week</td><td>Term Work: 25 Marks
Oral: 25 Marks</td><td>Term work & Oral: 01</td></tr>
</table>

<table>
<tr><td colspan="2">Course Pre-requisites:</td></tr>
<tr><td colspan="2">The Students should have knowledge of</td></tr>
<tr><td>1.</td><td>Basic Civil Engineering. and Civil Engineering Drawing Knowledge</td></tr>
<tr><td>2</td><td>Knowledge of Building Planning and Designing.</td></tr>
<tr><td colspan="2">Course Objectives:</td></tr>
<tr><td></td><td>To develop the knowledge of basic Plumbing Engineering techniques required for various construction projects.</td></tr>
<tr><td colspan="2">Course Outcomes:</td></tr>
<tr><td colspan="2">On completion of the course, the students will be able to:</td></tr>
<tr><td>1.</td><td>Identify and select proper tools and use them for the given plumbing work</td></tr>
<tr><td>2.</td><td>Select appropriate pipes and carry out pipe fitting after carrying out operations like cutting, bending, threading, joining, aligning and other necessary operations</td></tr>
<tr><td>3.</td><td>Erect simple water supply system. Trace leakage and repair water supply system</td></tr>
<tr><td>4.</td><td>Plan, prepare and inspect domestic drainage system</td></tr>
<tr><td>5.</td><td>Select and install sanitary appliances</td></tr>
<tr><td>6.</td><td>Install heating appliances like geyser, etc.</td></tr>
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<table>
<tr><td>UNIT - I</td><td>Introduction to Plumbing System</td></tr>
<tr><td></td><td>Introduction to Plumbing System: Cold Water, Gray Water System, Sewage System,Hot Water Circulating System, Irrigation System,Storm Water System Common Sanitary Fixture Details: Lavatories, Water Closet, Showers, Sinks, Bathtubs,Bidets, Urinals, Floor drains, Layout of Sanitary fixtures in toilet Formula for flow through pipes: Darcy formula, Chezy's formula, Manning's formula, Hazen formula, Reynolds number (Laminar and Turbulent Flow)

Drainage System: Soil Pipe System, Waste Pipe System, Vent Pipe System, Types of Pumps, Pump Laws, Pump in series and parallel</td></tr>
</table>

UNIT - II	**Water System**
	Cold Water System : Domestic Water Tank (or) Underground reservoirSizing, Elevated Roof Tank (storage cistern) orOverhead tank Sizing, Cold Water Pipe Sizing inBuilding as per flow rate and fixture Unit Method(WFU), Minimum number of smaller diameterwater pipes that can be connected to bigger pipes.Plumbers Chart for Pipe Sizing, Box Formula, Boosterpump sizing & transfer, Pump Sizing(HPWatts), Auto Pneumatic, System & Pressure Tank Sizing,External Water Supply, Pipe Sizing, Pump RoomDesign with valve connection detail, Design of External Water System **Gray Water System:** Grey water cycle, Water Tank Sizing, Booster PumpCalculation, Grey water pipe sizing, Flush Water, Potable and non potable loop pipe sizing (Software). **Hot Water System:** Hot Water System Designing, Estimating Hot WaterDemand, Calculating the Capacity of Non-Central &Central Water Heaters, Hot Water Pipe Sizing, Hot Water Circulating Pump Design, Up feed System, Down feed System & Combination of Up feed andDown Feed System, Solar Water heater (EnergySaving Calculation). **Irrigation System:** Garden Water Supply and Fountain, Garden Water Supply and Fountain pipe sizing, Calculation ofstorage tank, Garden water fountain designing &pump selection **Drainage System:** Soil and Waste water drain calculation in buildingvertical stack, Branch drain / Discharge pipe,horizontal drain, Fixture unit rating, Maximumnumber of discharge unit allowed in stack, Design ofhorizontal drains by discharge unit method(DFU),Invert level & Slope calculation, Sump Pit Sizing,Submersible Sump Pump Sizing, Design of Septic tank, Soak away pits, Dispersion trenches, Oil andGrease Interceptor Designing, Designing of commonappurtenances, Inspection Chambers and Junctionmanholes, External foul water drainage for building. **Storm water System:** Designing of Storm water Drainage system inbuilding, Sizing of Rain Water Gutters, External Storm water drainage system Designing.
UNIT - III	**Water Balancing Calculation**
	Water Balancing Calculation. WTP(Water Treatment Plant), STP(Sewage Treatment Plant), Green Building (Water Saving Calculation), Plumbing Designing for High Rise Building, PRV Calculations
UNIT - IV	**Tendering Requirements**
	Understanding the tendering requirements, Quantity take off, Preparing Inquiry for Suppliers & Finalizing the suppliers, Final Billing & Quotations finalization
UNIT - V	**Preparation of purchase orders**
	Preparation of purchase orders, Quotation Evaluation Sheet

UNIT - VI	**Plumbing Design Drawing and site Installation**
	Representation of Concepts Design Drawing, Design Drawing & Shop Drawing, Location maps, Site Plan, Plan of Roof, Floor plan of the building, Enlarge floor plan of toilet kitchen, Plan elevation & cross section of structures including reinforcement details, Detailing of Plumbing services and preparing plumbing drawing, Isometric Drawings, Riser Diagram, Site Installation Procedure :Testing, Adjusting, Balancing Concept & Process. Installation & Inspection. Safety Measures. Pressure Testing. Testing& Commissioning. Tracking List.

Term Work: The term work shall consist of File and drawing containing record of (any 6) exercises out of which Term work No 6 and 7 are compulsory and project, listed below.

1. Introduction of available codes in plumbing.
2. Report on necessity of traps, intercepts and vents
3. Roles of plumbing contractor and plumbing consultants
4. Report on Plumbing fixtures and fittings and explain any ten.
5. Report on materials for water supply and drainage
6. Detailed hydraulic design for plumbing of G+1 Bungalow
7. Design solar water piping for G+1 Bungalow
8. Detailed Plumbing design for high rise structure
9. Drafting purchase orders for Plumbing Project
10. Project 1: This syllabus will followed by a live project and a 2 Days Workshop on project implementation
    OR
    Project 1: Site Visit and report on site visit
11. Project 2 :Plumbing Design Drawing and site Installation For a G+1 Bungalow

Text Books

1. "Plumbing Engineering, Theory and Practice" by Subhash Patil. SEEMA Publishers Mumbai
2. " Plumbing Engineering" by Deolalikar

Reference Books:

1. "Plumbing, Sanitation and Domestic Engineering" Volume – 1to 4 by G. S. Williams, Mc Graw Hill
2. "Plumbing, Sanitation and Domestic Engineering, Data Sheets & Wall Charts" by G. S. Williams, Mc Graw Hill
3. Codes -- Uniform Plumbing Code-India

Programme: B. Tech. (Civil) Sem – IV 2021 Course: CONSTRUCTION PRACTICES IN CIVIL ENGINEERING		
TEACHING SCHEME	**EXAMINATION SCHEME**	**CREDITS ALLOTTED**
Practical: 02 Hrs/Week	Term Work –50 marks	Term Work:01

Course Pre-requisites:	
The Student Should have knowledge of	
1.	Fundamental of Civil engineering.
2.	Building Construction
3.	Engineering mathematics.
4.	Concrete Technology
5.	Building Planning, Designing and Bylaws
Course Objective	
1.	To make students understand Civil Engineering Practices.
Course Outcomes	
The students will be able to	
1.	setout of foundation for buildings.
2.	carry out testing of construction materials
3.	manage inventory on site.
4.	maintain quality control on site.
5.	work as a site engineer
	List of Practical (Any 15)
1	Testing of concrete cubes of different grades.
2	Slump test on concrete and effect of plasticizers.
3	Study of reinforcement and its bending for different structural members.
4	Study of various of drawings required on construction sites (Compulsory)
5	Setting out and layout of building foundation.

6	Study of formwork& scaffolding. (Compulsory)
7	Construction of different types of brick masonry bonds, study of recent types of bricks and blocks (Compulsory)
8	Study of plastering & pointing. (Compulsory)
9	Study of different types of tiles. (Compulsory)
10	Introduction - Water supply & sanitary fittings and appliances (Compulsory)
11	Concealed construction practices.
12	Types of paints. (Compulsory)
13	Methods of Waterproofing of toilets & roofs. (Compulsory)
14	Study of Deck Slab
15	Study of stock register format and daily report. (Compulsory)
16	Study of construction of concrete walls
17	Study of precast techniques (Compulsory)
18	Study of Advance Water proofing Techniques
Reference Books:	
1.	A to Z Building Construction by Mantri publication.
2.	My Construction Practices by R.B. Chaphalkar.

Program: B. Tech. Civil Sem: V

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Analysis of Indeterminate Structures	4	-	-	60	40	-	-	-	100	4	-	-	4
2.		Infrastructure and Transportation Systems	4	2	-	60	40	25	25	-	150	4	1	-	5
3.		Arbitration and Laws Related to Construction Industry	3	-	-	60	40	-	-	-	100	3	-	-	3
4.		Advanced Surveying with Geomatics**	3	2	-	60	40	25	25	-	150	3	1	-	4
5.		Limit State Design of Steel Structures*	4	2	1	60	40	25	25	-	150	4	1	1	6
6.		Vocational Course-III: Structural Assessment and Retrofitting / Industrial Orientation for Civil Engineers-I	-	2	-	-	-	25	25	-	50	-	1	-	1
7.		Civil Engineering Software – II (Staad Pro)	-	4	-			25	-	25	50	-	2	-	2
	Total		**18**	**12**	**1**	**300**	**200**	**125**	**100**	**25**	**750**	**18**	**6**	**1**	**25**
	Environmental Studies***		2	-	-	50	-	-	-	-	-	-	-	-	-
	Social Activity- II ****		-	-	-	-	-	-	-	-	-	-	-	-	2

*Theory paper of 4 hours duration
**Industry Taught Course – III
** *Mandatory audit course
**** Add on course

Programme: B. Tech. (Civil) Sem –V (2021)

COURSE: ANALYSIS OF INDETERMINATE STRUCTURES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Analysis of Determinate Structures
2	Mechanics of Solids
3	Statics and Dynamics

Course Objective:

The student should be able to calculate member forces and deflection of members of indeterminate beams and frames.

Course Outcomes: The student will be able to

1	calculate plastic moment capacity of section.
2	analyse Indeterminate truss using strain energy method.
3	calculate fixed end moments.
4	analyse plane structure using slope deflection method.
5	analyse plane structure using moment distribution method.
6	analyse frame using approximate method.

Course Content:

Unit-I	**Plastic Analysis of Structure:** Elastic and Plastic moment capacity, Plastic hinge, Shape factor, Collapse mechanism, Applications to continuous beams, Fixed beams, Singlebay single storied rectangular frames.	**(08 Hours)**
Unit-II	**Analysis of Indeterminate Plane Trusses using Castigliano's theorem:** Analysis of indeterminate trusses by application of Castigliano's second theorem; Effect of Internal and External indeterminacy, Effect of Lack of fit, Temperature changes and Sinking of support. (Maximum 2 degree of indeterminacy)	**(08 Hours)**
Unit-III	**Fixed Beam and Clapeyron's Three Moment Theorem:** Fixed Beam: Calculation of fixed end moments due to different types of loads; Effect of sinking of support. Clapeyron's Three moment theorem: Analysis indeterminate beams using three moment theorem for different support conditions; Effect of sinking of support.	**(08 Hours)**
Unit-IV	**Slope Deflection Method:** Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of non- sway and sway rectangular portal frames (with indeterminacy up to 3 degrees);	**(08 Hours)**
Unit-V	**Moment Distribution Method:** Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of non-sway and sway rectangular portal frames (with indeterminacy up to 3 degrees).	**(08 Hours)**
Unit-VI	**Approximate Methods of the Analysis:** Approximate methods of analysis of multistoreyed, multibay, 2-D rigid jointed frames by i) Portal method ii) Cantilever method	**(08 Hours)**

	iii) Substitute Frame Method	

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Prepare PowerPoint presentation on plastic hinge formation and numerical example on it.
2	Prepare chart of location of plastic hinges for different beams and frames.
3	Analyse indeterminate truss using software and compare result with manual solution.
4	Prepare PowerPoint presentation on analysis of indeterminate trusses.
5	Prepare PPT/chart on deflected shape of different structures.
6	Analyse fixed beam using software and compare result with manual solution.
7	Prepare PowerPoint presentation on fixed end moments for different loading cases.
8	Prepare chart on fixed end moments for different loading cases.
9	Analyse indeterminate beam using software and compare result with manual solution.
10	Prepare PowerPoint presentation on slope deflection method.
11	Analyse indeterminate plane frame using software and compare result with manual solution.
12	Prepare PowerPoint presentation on moment distribution method.
13	Analyse plane frame for lateral loads using software and compare result with approximate method.
14	Prepare PowerPoint presentation on portal method of analysis.
15	Prepare PowerPoint presentation on cantilever method of analysis.
16	Prepare PowerPoint presentation on portal method of analysis.

Textbooks:

1	Bhavikatti S.S., “Structural Analysis- I and II”, Vikas Publication
2	Menon Devdas “Structural Analysis”, Alpha Science International Publication
3	Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company
4	Prakash Rao D. S., “Structural Analysis”, Universities Press Publication

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2	Aslam Kassimali, “Structural Analysis”, Cengage Learning.
3	Pandit G. S. & Gupta S. P., “Theory of Structures Vol-I”, Tata McGraw Hill Publication
4	Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication

Programme: B. Tech. (Civil) Sem – V (2021)

COURSE: INFRASTRUCTURE AND TRANSPORTATION SYSTEMS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of	
1	Construction and Materials
2	Construction Equipments and Methods
3	Economics and Finance
Course Objective:	
	The student should be able to plan and design the highway with consideration to traffic, geometry and pavement material using the standard codes.
Course Outcomes: The student will be able to	
1	describe the scope of road transportation & significance of highway engineering.
2	evaluate in detail the planning of transport system.
3	design the roads by considering its geometry.
4	analyze various materials used in highway construction & design the pavements.
5	describe the process of highway construction, highway drainage and its maintenance.
6	apply urban transport technology & its financing

Course Content:

Unit-I	**Introduction to Highway Engineering:** Role of transportation, scope of road transportation, Classification of roads, highway development in India, necessity of highway planning and development plans e.g. Bombay plan, Lucknow plan. Highway alignment: Basic requirements of an ideal alignment and factors controlling it.	**(08 Hours)**
Unit-II	**Transport System Planning:** Traffic characteristics-road user characteristics, vehicular characteristics, Traffic studies, level of service, traffic analysis, speed delay studies, parking studies, OD matrix, Types of Surveys, Travel demand forecasting-trip generation, trip distribution, modal spilt analysis, trip assignment	**(08 Hours)**
Unit-III	**Geometric Design:** Design controls and criteria for geometric design, Cross sectional elements, Sight distance requirements, Stopping distance, Overtaking sight distance, Overtaking zones with IRC recommendations, Attainment of super elevation, Vertical alignment, Gradient and its type with IRC recommendations.	**(08 Hours)**
Unit-IV	**Highway materials & Pavement Design:** Importance and properties of sub-grade, pavement component materials, Tests on aggregates. Bitumen: Types-cut back, tar, emulsion and tests on bitumen. Pavement design: Objects and requirements, Types of pavements structures, Functions of pavement components, Factors affecting pavement design, Design of flexible pavement by C.B.R. Method, IRC 37- guidelines, Design of rigid pavements, IRC 58- Design guidelines, Introduction to mechanistic designs.	**(08 Hours)**

Unit-V	**Highway Construction, Drainage & Maintenance:** Highway Construction: Construction of various types of roads, Joints in cement concrete pavements. Highway Drainage: Significance of drainage, Requirements of drainage, Surface Drainage, Sub-surface Drainage. Highway Maintenance: Causes of failure of road pavements, Maintenance of rigid and flexible pavements.	**(08 Hours)**
Unit-VI	**Urban Transport Technology & Financing:** Mass Rapid Transit System, Intelligent Transport System, Introduction to-BRT, Monorail, sky bus, metro projects and concept of Integrated Inter Model transit system, Significance of Transit oriented development, Concept of green highway. Financing: Financing of road projects, BOT, BOOT, PPP models.	**(08 Hours)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Prepare a poster on highway development plans
2	Prepare a poster on Classification of Roads
3	Write short note on various surveys in Transport Planning
4	What are the Travel demand forecasting techniques
5	Prepare a power point presentation on Traffic Problems in metro cities
6	Solve a numerical on calculation of sight distance on highway
7	Prepare a power point presentation on various geometric design parameters
8	Prepare a chart for mechanistic design of pavements
9	Prepare a power point presentation on the materials used in road construction
10	Pavement design of highways (rigid and flexible) according to IRC guidelines
11	Write a case study on Highway maintenance
12	Write the importance of mass rapid transit system in Urban areas
13	Write case study of land use and transport planning.
14	Write a case study on BOT, BOOT type of Project.
15	Case study on metro/ monorail project

Practical:

1.	Tests on Aggregate **(Compulsory)**
	a. Aggregate Impact Value Test
	b. Specific Gravity and Water Absorption Test by basket method
	c. Shape Test (Flakiness Index and Elongation Index)
	Test on Aggregate **(Any one)**
	d. Los Angeles Abrasion Test
	e. Aggregate Crushing Strength Test
2.	f. Stripping Value Test
	Tests on Bitumen **(Compulsory)**
	a. Ductility Test
	b. Specific Gravity Test
	Tests on Bitumen **(Any One)**
	c. Penetration Test
3.	d. Softening Point Test

	e. Bitumen Emulsion Test
	Traffic and Transportation Planning
	a. Traffic Count Survey
4.	Site visit **(Any One)**
	a. Hot Mix Plant
	b. Ongoing Road Construction
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Khanna S. K. & Justo C. E. G., "Highway Engineering", Nem Chand & Bros Publishers, Rorkee, Uttarakhand
2	L. R. Kadiyali, "Traffic Engineering and Transport Planning" Khanna Publishers.
3	F. L. Mannering, Scott S. Washburn, Wiley India "Principles of Highway Engineering and Traffic Analysis (4th edition)"
Reference Books:	
1	David Croney, & Paul Croney, "The Design and Performance of Road Pavements" McGraw-Hill Book Company.
2	Michel A. Taylor, William Young, & Peter W Bonsall, "Understanding Traffic System" Taylor and Francis Group.
3	B. G. Hutchinson, "Principles of Urban Transport Systems Planning" Publisher, Scripta Book Company, 1974.
4	Laurence I. Hewes & Clarkson H. Oglesby, "Highway Engineering" John Wiley & Sons.
5	Dr. V. K. Raina, "Raina's Field Manual for Highway and Bridge Engineers" Handbook.
6	Nicholas J. Garber & Lester A. Hoel, "Traffic & Highway Engineering" Edition 4, Publisher, Cengage Learning, 2008.
7	S. P. Bindra, "A Course in Highway Engineering", Dhanpat Rai and Sons, Delhi.
8	G. V. Rao, "Transportation Engineering", Tata McGraw Hill Publication.
Codes:	
1	Indian Road Congress (IRC) 58 – 2018 for Rigid Pavement Design.
2	Indian Road Congress (IRC) 37 – 2018 for Flexible Pavement Design.
3	Specifications for Road and Bridge works (MORTH)-IRC, New Delhi.

Programme: B. Tech Civil Sem –V (CBCS-2021)

Course: ARBITRATION AND LAWS RELATED TO CONSTRUCTION INDUSTRY

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours/Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 03
		Total: 03

Course Pre-requisites: The students should have knowledge of	
1	Economics & Finance
2	Building Construction.
3	Building Planning and Design
4	Planning & Management of Construction Projects
Course Objectives:	
	To study different types of contracts in construction, arbitration and legal aspects and its provision.
Course Outcomes: The student will be able to	
1	describe importance of Arbitration in Civil Engineering Industry.
2	classify methods of dispute resolution in construction industry.
3	explain Conciliation and its provisions in dispute resolution.
4	describe Importance and Provisions of Indian Contracts Act.
5	explain different labour Laws.
6	explain various Environmental laws in India.

Course Content:

UNIT - I	**Arbitration:** Importance of Arbitration in Construction Industry, Arbitration Process, Causes and resolution of disputes, settlement for claims and extra items, arbitration. Comparison Laws-Agreements, Alternative Dispute Resolution.	**(06 Hours)**
UNIT - II	**Dispute Resolution in Construction:** Dispute Resolution methods- mediation, conciliation, arbitration and Dispute Resolution Boards Arbitration and Conciliation Act 1996, Extent of application of 1996 Act. Arbitrators-Conditions of Arbitrations-Powers and duties of Arbitrators	**(06 Hours)**
UNIT - III	**Conciliation:** Conciliation and its provisions in the Act, Conduct of conciliation and arbitral proceedings, grounds for challenge. Arbitral award and its enforcement. Procedure of appeal against the awards	**(06 Hours)**
UNIT - IV	**Contract Law:** Indian Contract Act, 1872-Importance and Provisions, Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act, Requirements of Indian Contract Act.	**(06 Hours)**
UNIT - V	**Labour Law:** Industrial Disputes Act, 1947 Importance and Provisions, Requirements of Indian Contract Act, Workmen's Compensation Act 1923, Minimum Wages Act 1948, Payment of Wages Act 1936 with the Amendment Act 2017, The Code on Social Security, 2020, New Labor Code for India, The Mines Act, 1952, Inter-State Migrant Workmen Act, 1979.	**(06 Hours)**
UNIT - VI	**Environmental Laws:**	**(06 Hours)**

	The Environment (Protection) Act, 1986 – Aims and Objectives, Powers and Functions of the Central Government, Air (Prevention and Control of Pollution) Act, 1981- Air Pollution – Meaning, Causes and Effects, The Water (Prevention and Control of Pollution) Act, 1974, Water Pollution- Meaning, Central & State Pollution Control Board-Constitution, Powers and Functions.	

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Prepare a report on case study of Arbitrations in Construction Industry.
2	Prepare a report on case study for settlement for claims.
3	Prepare a report on Alternate Dispute Resolution.
4	Case Study on Dispute Resolutions in Constructions.
5	Brief report on Arbitration and Conciliation Act 1996.
6	Brief report on Conciliation and its provisions in the Act.
7	Brief report on Arbitral award and its enforcements.
8	Case study report on Indian Contract Act.
9	Brief report with case study on Importance and provisions of Indian Contracts Act.
10	Case Study report on Industrial Disputes Act 1947.
11	Brief report on the Mines Act 1952.
12	Brief report on Code on Social Security.
13	Brief report on new Labour Codes for India.
14	Case study report on the environment protection act.
15	Case Study report on Water (Prevention and Control of Pollution) Act, 1974.

Textbooks:

1	B. S. Patil, "Civil Engineering Contracts and Estimates", Universities Press- 2006 Edition, Reprinted in 2009.
2	The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional Book Publishers.
3	The Arbitration and Conciliation Act, (1996), 1996 (26 of 1996) - 2006 Edition, Professional Book Publishers.

Reference Books:

1	Dr. R.K. Bangia, "Law of contract Part I and Part II", 2005 Edition, Allahabad Law Agency.
2	Standard General Conditions for Domestic Contracts- 2001 Edition- Published by Ministry of Statistics and Program Implementation, Government of India.
3	Dispute Resolution Board Foundation Manual-www.drbf.org.
4	Shyam Diwan and Armin Rosenkranz, "Environmental Law and Policy in India– Cases, Materials and Statutes" (2nd edition, 2001), Oxford Publisher.
5	P. Leela Krishnan, "Environmental Law in India" (5th edition, 2019), Lexis Nexis Publisher.

Programme: B. Tech. (Civil) Sem – V (2021)

COURSE: ADVANCED SURVEYING WITH GEOMATICS (ITC III)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 03 Practical: 01
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Basic Surveying.
2	Engineering Mathematics
3	Applied Physics

Course Objective:

To make students aware about Advanced surveying techniques such as Total station Survey, Space based positioning techniques and Remote sensing and GIS.

Course Outcomes: The student will be able to

1	describe Triangulation Survey and carryout triangulation adjustments
2	demonstrate Total station for various surveys.
3	describe principles of remote sensing techniques and its applications
4	describe principles of GIS and its applications.
5	describe principles of SBPS and its applications
6	describe process of Photogrammetry and its applications.

Course Content:

Unit-I	**Geodetic Control Survey:** Introduction to geodetic control survey, System- Triangulation and Trilateration, Triangulation stations and figures, concept of base line. Types of errors, Probable error and its determination, Laws of weights, Method of least squares, Normal equation, Adjustment of triangulation figure.	**(06 Hours)**
Unit-II	**Modern Survey Instrument:** Concept and necessity of an electronic total station instrument. Types of total station as per EDM, range and angle resolution system. Principle features of an ETS, temporary adjustments, On board programmes such as REM, RDM, Free stationing, resectioning etc. traverse survey with ETS. Data retrieval and field generated graphics Concept of data downloading and post processing software, Errors in ETS survey.	**(06 Hours)**
Unit-III	**Remote Sensing**: Concepts Definition, History Development, Stages in RS-EMR, EMR Spectrum, Theories of EMR, Types of RS and Laws of Radiation, Introduction to solar spectrum. Interaction of EMR: Interaction with Earth's Atmosphere, Atmospheric Window Fundamentals of Radiometry: concept of solid angle, radiometric measurements, observation geometry in RS. Spectral Signature: Interaction with Soil, Water and Vegetation Platforms, Sensors, Orbits: Types of Platforms, Types of Sensors, Cameras and Satellite Orbits Data Products: Satellite Data Generation, Type of data Formats and Aerial Photography Products.	**(06 Hours)**

Unit-IV	**GIS**: Definitions, Evolution, Components and Objectives, Overview of GIS Software Packages. Spatial Data: Types of Geographic Data, Levels of Measurements. Concepts of Space and Time, Layers Coverage. Spatial Data Models, Representation of Geographic Features in Vector, Raster Data Models. Spatial Data Input: Digitization, Error Identification. Errors: Types, Sources, Correction. Editing and Topology Building.	**(06 Hours)**
Unit-V	**Introduction and concept SBPS:** Segments of SBPS- space, control and user. GNSS type SBPS in action-GPS, GLONASS, Compass. RNSS type SBPS in action-Quasi zenith, IRNSS. GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential, Access denial techniques and ephimeris. SBPS coordinates and heights, Surveying with SBPS, Errors in positioning with SBPS. Applications of SBPS.	**(06 Hours)**
Unit-VI	**Photogrammetry:** Elements of photogrammetry, Types of photogrammetry. Aerial photographs their types and scale, Concept of relief displacement, Stereoscopy, parallax and mirror stereoscope, parallax equation and difference in elevation from differential parallax, Ground control, Procedure of aerial survey and flight planning, LIDAR and its applications.	**(06 Hours)**

Internal Assessment:

Unit Test -I	UNIT – I, II, III
Unit Test -II	UNIT – IV, V, VI

Project Based Learning:

1	Carry out triangulation survey using three stations and perform triangulation adjustments.
2	Carry out survey of the area using electronic total station and prepare a plane table map and contour map.
3	Using a handheld GPS perform a driver survey and locate coordinates of traverse stations.
4	Carry out urban planning with the use of photogrammetry.
5	Carry out urban growth monitoring using photogrammetry.
6	Carry out transport planning using photogrammetry.
7	Carry out water resources assessment using remote sensing and GIS.
8	Carry out land use and power analysis using remote sensing and GIS.
9	Carry out assessment of crop yield using remote sensing and GIS.
10	Carry out reservoir sedimentation studies using remote sensing and GIS.
11	Report on various remote sensing data products available from various sources like BHUVAN NRSA Hyderabad etc.
12	Carry out setting off layout for foundation using electronic total station.
13	Carry out electronic total station survey for contour mapping.
14	Carry out electronic total station survey for profile levelling.
15	Carry out electronic total station survey for laying out pipeline.

Practical:

1	Study and use of total station for traverse survey. (3 Practicals).
2	Applications of Total Station for REM, RDM. (1 Practical).
3	Study and Use of Mirror stereoscope with parallax bar. (1 Practical).
4	Overview of Arc GIS Attribute Data Input: Creation of Schema, Tables, Data Definition, Data

	Input, Data Updating, Queries on Tables, Simple-Complex Query with Two or More Tables Using SQL. Queries Using Union (4 Practicals).
5	Spatial Data Input: Vector Data Formats with File Extensions. Scanning, On-Screen Digitization, Editing, Topology Creation, Line and Area Measurements, Data Attribution (4 Practicals).
6	Georeferencing Data: Coordinate Systems, Datum Conversions, Map Projections, Types, Storing- Viewing Projection Information. (3 Practicals).
7	Working with Layers in Arc map: Building Templates, Classification, Displaying Qualitative and quantitative Values, Labelling Features and Map Creation. (3 Practical).
8	Surface Analysis: DEM, DSM and DTM, Presenting Data: Map Design, Map Composition (4 Practical).
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Duggal S. K., “Surveying Vol-1, Vol-2”, Tata McGraw Hill pub. Co., New Delhi
2	Punmia B. C., “Higher Surveying”, Laxmi Publications, New Delhi
3	Chandra A.M.,” Higher Surveying”, New Age International Publishers
4	Bannister A. and Raymond Baker, “Surveying”, Pearson Education
5	Anji M. Reddy, “Textbook of Remote Sensing and GIS “, BSP BS Publications
Reference Books:	
1	Uren J., & W. F. Price, “Surveying for Engineers”, Macmillan Publication.
2	Wolf P. R., “Elements of Photogrammetry”, McGraw Hill Publication.
3	Agarwal C. S., & Garg P. K., “Remote Sensing in Natural Resources”, Wheeler Publishing
4	Lo C.P., & Albert Yeung, “Concepts and techniques of GIS “, Prentice Hall of India Publication.
5	Bao, J., & Tsui, Y., “Fundamentals of Global Positioning System Receivers”, John Wiley Sons, Inc., Hoboken Publication.

Programme: B. Tech. (Civil) Sem –V (2021)

<table>
<tr><td colspan="4">COURSE: LIMIT STATE DESIGN OF STEEL STRUCTURES</td></tr>
<tr><td colspan="2"><u>TEACHING SCHEME:</u></td><td><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS:</u></td></tr>
<tr><td colspan="2">Theory: 04 Hours / Week
Practical: 02 Hour / Week
Tutorial: 01 Hour / Week</td><td>End Semester Examination: 60 Marks
Internal Assessment: 40 Marks
Term work: 25 Marks
Oral: 25 Marks</td><td>Theory: 04
Practical: 01
Tutorial: 01</td></tr>
<tr><td colspan="2"></td><td></td><td>Total: 06</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Course Pre-requisites: The students should have knowledge of</td></tr>
<tr><td>1</td><td colspan="3">Analysis of Determinate and Indeterminate Structures.</td></tr>
<tr><td>2</td><td colspan="3">Mechanics of Solids.</td></tr>
<tr><td colspan="4">Course Objective:</td></tr>
<tr><td></td><td colspan="3">The student should be able to design different structural steel members using relevant code of practise with consideration to safety, serviceability and economy.</td></tr>
<tr><td colspan="4">Course Outcomes: The student will be able to</td></tr>
<tr><td>1</td><td colspan="3">estimate design load.</td></tr>
<tr><td>2</td><td colspan="3">design connection for axial load.</td></tr>
<tr><td>3</td><td colspan="3">design members for axial tension.</td></tr>
<tr><td>4</td><td colspan="3">design members for axial compression.</td></tr>
<tr><td>5</td><td colspan="3">design built up column.</td></tr>
<tr><td>6</td><td colspan="3">design beam.</td></tr>
<tr><td colspan="4">Course Content:</td></tr>
<tr><td>Unit-I</td><td colspan="2">Design Philosophy:
Types of structural elements and their behaviour, Introduction to IS 875, Types of Loads, Estimation of Loads, Wind Load on Roof Truss. Load combinations, Design Load.
Steel as a structural material, Type of structural steel, Mechanical Properties, Rolled steel sections and engineering properties, Introduction to SP 6(1), Strength of Section, Design strength, Partial safety factors, Concept of Limit state design, Introduction to IS 800.</td><td>(08 Hours)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Design of Connections for Axial Load:
Types of fasteners, advantages and disadvantages, Types of bolts, Design strength of bolts, Design of bolted connection and detailing, Strength of weld, Design of weld and detailing.</td><td>(08 Hours)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Design of Axially Loaded Tension Members:
Behaviour of member in tension, Axial tension capacity of plates, single and double angles and channel section, Design of axially loaded Tension members.</td><td>(08 Hours)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Design of Axially Loaded Compression Members:
Behaviour of member in compression, Concept of Effective Lengths, Axial compression capacity of single and double angle section, Design of axially loaded compression members</td><td>(08 Hours)</td></tr>
<tr><td>Unit-V</td><td colspan="2">Design of Built up Column and Column Base:
Axial compression capacity of Built up Column, Design of built up column, Design of Lacing system, Design of battening system, Design of slab base, Design of gusseted base.</td><td>(08 Hours)</td></tr>
<tr><td>Unit-VI</td><td colspan="2">Design of Beams:
Behaviour of beams, Shear and moment capacity of Laterally supported and laterally unsupported beam. Design of beam, Design of built up section, Curtailment of plates, Design of bolted connections for shear and moment.</td><td>(08 Hours)</td></tr>
</table>

	Introduction to Plate Girder.	

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Make model of different types of structural steel sections.
2	Make model of different types bolted connections in structural steel.
3	Make model of different types of welded connections in structural steel.
4	Prepare PPT on Limit state design philosophy.
5	Prepare PPT on estimation of design load due to DL, IL, WL and their combination.
6	Prepare PPT on properties of a section.
7	Prepare PPT on calculation of design strength of bolted connection.
8	Write programme on calculation of design strength of bolted connection.
9	Prepare PPT on design of welded connection.
10	Write programme on design of welded connection.
11	Prepare PPT on calculation of design axial tensile strength of a member.
12	Write programme on calculation of design axial tensile strength of a member.
13	Prepare PPT on calculation of design axial compressive strength of a member.
14	Write programme on calculation of design axial compressive strength of a member
15	Prepare PPT on calculation of design moment and shear capacity of a member.
16	Write programme on calculation of design moment and shear capacity of a member.
17	Model making and testing of structural elements.

Term work: The term work shall consist of

a) Sketching of structural elements, joints and connections, built up sections, column base, etc (any 8 sketches)

b) Design of any **ONE** projects with 2 number of half imperial sheets based on following topics:

1	**Design of Roof Truss:** Load estimation, Analysis of truss, Design force for member, Design of Members, Design of connection, Design of Purlin, Drawing.
2	**Design of Building:** Load estimation, Analysis of frame, Design of Secondary beams, main beams, Columns, Beam to Beam, Beam to Column connections, column bases, etc.

Oral:

	The oral examination will be based on above term work and course content.

Textbooks:

1	S. S. Bhavikatti, “Design of Steel Structures: By Limit State Method”, I. K. International Publication.
2	Dr. Ramchandra, “Limit State Design of Steel Structures”, Scientific Publication.
3	Dr. M. R. Shiyekar, “Limit State Design in Structural Steel”, Prentice-Hall of India Publication.

Reference Books:

1	N. Subhramanian, “Design of Steel Structures”, Oxford University Press Publication.
2	S. K. Duggal, “Limit State Design of Steel Structures”, Tata McGraw-Hill Publication.

Codes:

1	IS:800-2007, General Construction in Steel - Code of Practice”
2	IS:875-(Part 1 to 5), “Code of Practice for Design Loads for Buildings and Structures”

3	IS:808-2021, “Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections”
4	SP-6(6)- 1972, “Handbook for Structural Engineers”

Programme: B. Tech. (Civil) Sem – V (2021)

COURSE: STRUCTURAL ASSESSMENT AND RETROFITTING* (VC III)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical: 02 Hours / Week	Term work: 25 Marks Oral: 25 Marks	Practical: 01
		Total: 01

Course Pre-requisites: The students should have knowledge of		
1	different types and modes of failure of structures.	
2	difference between repair, retrofitting and rehabilitation.	
Course Objective:		
	To develop the knowledge about structural assessment and various retrofitting techniques in Civil engineering field.	
Course Outcomes: The student will be able to		
1	diagnose the distress in the structure.	
2	decide suitable assessment technique.	
3	suggest appropriate retrofitting and rehabilitation technique.	
Course Content:		
Unit-I	**Structural Assessment:** Need of structural assessment and monitoring, Principles of structural assessment, Current scenario of infrastructure through case studies. Introduction to global infrastructure crisis.	**(08 hours)**
Unit-II	**Structural Assessment Techniques:** Structural health monitoring, Visual observations, Non-destructive and destructive testing, static and Dynamic Field Testing, Selection of suitable technique of structural assessment, Case study of structural assessment report.	**(08 hours)**
Unit-III	**Retrofitting & Rehabilitation of Structures:** Methods of retrofitting & rehabilitation, Materials for retrofitting & rehabilitation (conventional and smart materials), selection of suitable retrofitting & rehabilitation method.	**(08 hours)**
Term Work: (Any Eight) Practical on		
1	methods on visual observation.	
2	testing methods and sampling techniques.	
3	working principle of Rebound Hammer.	
4	calibration of Rebound Hammer.	
5	compressive strength of structural element by Rebound Hammer.	
6	limitations of Rebound Hammer.	
7	working principle of Ultrasonic Pulse Velocity meter.	
8	calibration of Ultrasonic Pulse Velocity meter.	
9	surface preparation of structural elements for Ultrasonic Pulse Velocity meter.	
10	compressive strength of structural element by Ultrasonic Pulse Velocity.	
11	data collection, processing and interpretation of the results of Ultrasonic Pulse Velocity.	
12	different retrofitting techniques and materials available and its selection.	
13	Preparation of structural assessment report.	
Oral:		
	The oral examination will be based on above term work and course content.	

Textbooks:	
1	Gandhi and Thompson, “Smart Materials and Structures”, Chapman and Hall publications.
2	Fu-Kuo Chang, “Structural Health Monitoring: Current Status and Perspectives”, SAE International publications, 2019.
Reference Books:	
1	Daniel Balageas, Claus-Peter Fritzen, & Alfredo Guemes, “Structural Health Monitoring”, John Wiley & Sons, 2006.
2	Douglas E., “Adams Health Monitoring of Structural Materials and Components”, Methods with Applications”, John Wiley and Sons, 2007.
3	J. P. Ou, H. Li & Z. D. Duan, “Structural Health Monitoring and Intelligent Infrastructure, Volume 1”, Taylor and Francis Group, London, UK, 2006.
4	Victor Giurglutiu, “Structural Health Monitoring with Wafer Active Sensors”, Academic Press Inc, 2007.
Codes:	
1	IS 516 (Part 5/Sec 1) : 2018 Hardened Concrete —Methods of Test Part 5 Non-destructive Testing of Concrete Section 1 Ultrasonic Pulse Velocity Testing (First Revision)
2	IS 516 (Part 5/Sec 4) : 2020 Hardened Concrete —Methods of Test Part 5 Non-Destructive Testing of Concrete Section 4 Rebound Hammer Test (First Revision)

Programme: B. Tech. (Civil) Sem –V (2021)

COURSE: CIVIL ENGINEERING SOFTWARE – II (STAAD PRO)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical: 04 Hours / Week	Term work: 25 Marks Practical: 25 Marks	Practical: 02
		Total: 02

Course Pre-requisites: The students should have knowledge of

1	Mechanics of Solids.
2	Analysis of Determinate and Indeterminate Structures.
3	Structural Design.

Course Objective:

The student should be able to design structure using FEM software.

Course Outcomes: The student will be able to

1	model the structure using FEM software.
2	apply loads, analyse the structure and interpret the analysis output.
3	design the structure using FEM software.

Course Content:

Unit-I	**FEM Model:** Generation of Geometry, Assign Section properties, Support Conditions and Specifications.	**(16 Hours)**
Unit-II	**Analysis Output:** Application of Loads and Load Combinations for Analysis, Analysis of Structure, Read and Interpret analysis output.	**(16 Hours)**
Unit-III	**Structural Design:** Design parameters, Design of members and Interpret design output, Preparation of Design Report.	**(16 Hours)**

Term work: Term work consists of following practical using FEM Software.

1	FEM Model of beams.
2	FEM Model of plane and space frame.
3	FEM Model of plane truss and space truss.
4	Analysis of FEM Model of beams.
5	Analysis of FEM Model of plane and space frame.
6	Analysis of FEM Model of plane truss and space truss.
7	Design of beams.
8	Design of plane and space frame.
9	Design of plane truss and space truss.

Practical Exam:

The practical examination will be based on above term work and course content.

Reference Books:

1	"STAAD.Pro V8i Technical Reference Manual", Bentley Communities.
2	Sham Tickoo, "Learning Bentley Staad.Pro V8i for Structural Analysis", BPB Publications.
3	Sham Tickoo/TIET, "Exploring Bentley's Staad.Pro Connect Edition", BPB Publications.
4	T. S. Sarma, "Staad Pro V8i for Beginners: With Indian Examples", Notion Press.
5	T. S. Sarma, "Design of Industrial Steel Buildings Using Staad Pro: With Indian Examples", Notion Press.

Programme: B.Tech. (Civil) Sem –V (2021)

SOCIAL ACTIVITY II (Add on course)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
		Total: 02

Introduction:

The prime objective of Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune is holistic development of students. The learner achieves the status as whole, when he/she has not only achieved success in academics, but also has succeeded in bringing the nation up by connecting with socially left-out elements and bringing ray of hopes into their lives. In this respect, the new curriculum encourages the learner on the social activities. In this case, student's are provided with social activities by the colleges, but not limited to them.

Course Objectives:

1	To make people create balance, so they do not only focus on academic aspects, but there can also be other aspects to have in life.
2	To build better relationship with others.
3	To create great balance with the academic aspects.
4	To learn and understand society.
5	To develop the nature of help and enhance the ethical norms for behaviours.

Course Outcomes: The social activities make good impact on learners. **The learner will be able to**

1	**identify the Needs of Society:** It enables a learner to consider the perspective of other people and understand their needs by interacting with people from diverse backgrounds.
2	**recognize Different Perspectives and Engage Other Cultures:** Social events develop social skills and empathy- the outward- oriented dimensions of emotional intelligence (EQ). The interactions or conversations elicited by events helps students build relationships, understand different perspectives and engage other cultures. Social events provide as opportunity to expand one's social circle.
3	**maintain Positive Outlook Towards Life:** With high adaptability to diverse situation and good level of understanding of other's also less vulnerable to stressful situations and have fewer chances of getting involved in undisciplined behaviour. These students also have a more positive outlook on life.
4	**maintain Good Emotional Health:** With high adaptability of diverse situations and a good level of understanding of other's opinions, socially aware learners are less likely to indulge in negative behaviour. They are also less vulnerable to stressful situations and have fewer chances of getting involved in undisciplined behaviour. These students also have a more positive outlook on life.
5	**maintain Good Emotional Health:** Social activities keep the learner sharp and mentally engaged, and this is important to prevent the onset of serious diseases like dementia or Alzheimer. Connecting with others helps keep you in a positive mood, which in turn wards off depression by improving physical health and maintaining good emotional health as well.
6	**Sample list of Social Activities (not limited to them):** a. Organizing Educational Camps. b. Tree Plantation Drive. c. Offer Helping Hand for Martyrs Family by Fundraisers. d. National Service Scheme. e. Felicitation of people who have contributed to the society but now forgotten by society. f. Street Play on Social Awareness.

Program: B. Tech. Civil Sem: VI

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Water Supply Engineering	4	2	-	60	40	25	-	25	150	4	1	-	5
2.		Hydrology and Irrigation Engineering	4	-	-	60	40	-	-	-	100	4	-	-	4
3.		Design and Detailing of Reinforced Concrete Structures**	4	4	-	60	40	50	25	-	175	4	2	-	6
4.		Quantitative Techniques, Communication and Values	4	-	-	60	40	-	-	-	100	4	-	-	4
5.		Project Estimation and Valuation*	4	2	-	60	40	25	50	-	175	4	1	-	5
6.		Vocational Course-IV: Contracts and e-Tendering// Industrial Orientation for Civil Engineers-II	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total		**20**	**10**	**-**	**300**	**200**	**125**	**100**	**25**	**750**	**20**	**5**	**-**	**25**
	MOOC-II***		-	-	-	-	-	-		-	-	-	-	-	2

* Theory paper of 4 hours duration
** Industry Taught Course – IV
*** Add on course

Programme: B. Tech. (Civil) Sem – VI (2021)

COURSE: WATER SUPPLY ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Practical: 25 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of

1	Engineering Chemistry.
2	Engineering Mathematics.

Course Objective:

To make student aware of Conventional, Advance water treatment and water supply, also about water conservation and water audit along with water modelling software use in field.

Course Outcomes: The student will be able to

1	explain the water quality criteria and drinking water quality standards.
2	analyse and design the process Aeration and Sedimentation.
3	analyse and design the process filtration, Disinfection.
4	demonstrate the various advanced treatment system and knowledge about the recent advances in water treatment process.
5	design and evaluate water distribution system plumbing of buildings.
6	demonstrate process of water audit and various conservation methods related to Domestic Sector, Industrial Sector, Irrigation Sector.

Course Content:

Unit-I	**Sources and Quality of Water:** Public water supply system, Planning, Objectives, Design period, Population forecasting; Water demand, Sources of water and their characteristics, Analytical techniques, Surface and Groundwater, Impounding Reservoir, Development and selection of source, Source Water quality Characterization, Significance, Drinking Water quality standards. Water supply intake structures, Functions; Pipes and conduits for water, Pipe materials, Selection of pipe material, Hydraulics of flow in pipes, Transmission main design, Laying, jointing and testing of pipes, appurtenances, Types and capacity of pumps: Selection of pumps and pipe materials.	**(08 Hours)**
Unit-II	**Conventional Water Treatment: Aeration and Sedimentation:** Objectives of unit operations and processes, Principles, functions, and design of water treatment plant units. Aeration: Types of aerators, gravity aerator and fixed spray aerator. Sedimentation: Plain Sedimentation, Principles and types of plain Sedimentation, details of Sedimentation tank, types of tanks, inlet and outlet arrangements; Design criteria like surface overflow rate, detention time, weir loading, depth of tank. Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clariflocculator, Tube settlers: Introduction, Design of Tube settler.	**(08 Hours)**

Unit-III	**Conventional Water Treatment:** **Filtration, Disinfection:** Filtration: Necessity, mechanisms, Theory of filtration, types of filters, pressure filters, dual and multimedia filters, Different media, details of filter, Rapid sand filter and slow sand filter, design criteria, working and washing of rapid sand filter, design of rapid sand filter. Disinfection: Necessity, Different methods, Chlorination, Reactions involved, Free and combined residual chlorine, Break point chlorination.	**(08 Hours)**
Unit-IV	**Advanced Water Treatment:** Water softening, Desalination- R.O. Plant, demineralization, Adsorption Ion exchange, Membrane Systems, RO Reject Management, Iron and Manganese removal, De-fluoridation, Construction and Operation & Maintenance aspects, Recent advances, MBR process, Introduction to various water treatment modelling software.	**(08 Hours)**
Unit-V	**Water Distribution And Supply:** Requirements of water distribution, Components, Service reservoirs Functions, Network design, Economics, Analysis of distribution networks, Computer applications, Appurtenances, Leak detection. Principles of design of water supply in buildings: House service connection, Fixtures and fittings, systems of plumbing and types of plumbing, Introduction to SCADA and PLC for WTP and Water Distribution System including ESRs.	**(08 Hours)**
Unit-VI	**Water Audit and Water Conservation:** Water Audit, Benefits and Approach for Water Audit, Steps of Water Audit, Water Supply and Usage Study, Process Study, System Audit, Discharge Analysis, Water Audit Report, introduction to water audit for Domestic Sector, Industrial Sector, Irrigation Sector. Action Plan for Water Conservation, surface and ground water, Rain water harvesting, Action Points for Water Conservation, Domestic Sector, Industrial Sector, Irrigation Sector, Regulatory Mechanism for Water Conservation, Mass Awareness with respect to conservation Domestic Sector, Industrial Sector, Irrigation Sector.	**(08 Hours)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Collect information and write report on sources of drinking water of your city.
2	Collect information related to water quality standards.
3	Calculate water demand for your house.
4	Collect samples / broachers of appurtenances.
5	Collect pipe samples / brochures of various materials use for residential water supply Design tube settler.
6	Report on various types of Aeration with photos.
7	Draw Plan and section of conventional water treatment plan.
8	Design slow sand filter.
9	Importance of various types of disinfection (conventional to advance).
10	Collect information on advance water treatment plant and write report on its importance with

	respect to today's pollution.
11	List software used for water distribution system and explain any one.
12	Study plumbing system of your house and write report with neat sketch and photos Write a report on your ideas about Mass Awareness with respect to conservation. a. Domestic Sector. b. Industrial Sector. c. Irrigation Sector.
13	Draft report on water audit of our institute.
14	Carry out awareness program in society related to water conservation and its importance and draft report on it.
15	Visit industry and collect information on usage of water, water conservation and water audit.
Practical: (Any Eight) (Practical 1 to 7 are compulsory and any one from 8 to 10)	
1	Determination of pH and alkalinity of water samples.
2	Determination of Total Hardness and its components of water samples.
3	Determination of Chlorides of water samples.
4	Determination of Turbidity and optimum dose of alum for raw water samples.
5	Determination of optimum dose of chlorine and residual chlorine for water samples.
6	Site visit – Water Treatment Plant.
7	Computer applications - Water Treatment.
8	Computer applications– Analysis of distribution networks.
9	Draw Layout of water supply in residential buildings.
10	Water audit of water supply of our institute.
Practical Exam:	
	The practical examination will be based on above term work and course content.
Textbooks:	
1	A. C. Panchdhari , "Water supply and Sanitary Installation", Nisha Enterprises Delhi 2008.
2	P. K. Goel, "Water Pollution, Causes, Effects, and Control", New Age International Publisher 2006.
3	J. V. S Murty, "Watershed management", New Age International Publisher 2008.
4	Arcadio P. Sincere, & Gregoria A Sincero, "Environmental Engineering – A Design Approach", S. B. Patel, Charator Publishing House 2010.
5	Anil Kumar De, & Arnab Kumar De, "Environmental Engineering", New age international Publisher 2009.
6	Rajni Kant, & Keshav Kant, "Water Pollution Management, Control and Treatment", New age International Publisher 2016.
Reference Books:	
1	S. C. Rangwala, "Water Supply and Sanitary Engineering", published by S. B. Patel, Charator publishing house 2004
2	G. S. Birdie, "Water Supply and Sanitary Engineering", published by J. C. Kapur 1993
3	Dr. A. S. Patel, & Dr. D. L. Shah, "Water management, Conservation, Harvesting and artificial recharge", published by new age international publisher 2006
4	Steven C. Chapra, "Surface Water Quality Modelling", Tata McGraw-Hill Companies, Inc., New Delhi, 1997.

Codes:	
1	IS 1172:1993 Code of basic requirements for water supply, drainage and sanitation.
2	IS 2065:1983 Code of practice for water supply in buildings.

Programme: B. Tech. (Civil) Sem – VI (2021)

<table>
<tr><td colspan="3">COURSE: HYDROLOGY AND IRRIGATION ENGINEERING</td></tr>
<tr><td><u>TEACHING SCHEME:</u></td><td><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS:</u></td></tr>
<tr><td>Theory: 04 Hours / Week</td><td>End Semester Examination: 60 Marks
Internal Assessment: 40 Marks</td><td>Theory: 04</td></tr>
<tr><td></td><td></td><td>Total: 04</td></tr>
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Course Pre-requisites: The students should have knowledge of		
1	Fluid Mechanics and Open Channel Flow and Hydraulic Machinery.	
2	Engineering Mathematics I and Engineering Mathematics II.	
Course Objective:		
	To make student aware of applications of Hydrology in Water Resources Projects and irrigation methods.	
Course Outcomes: The student will be able to		
1	explain measurement of precipitation and analysis of precipitation data.	
2	identify and estimate losses from precipitation.	
3	identify the runoff and estimate runoff.	
4	describe ground water flow and estimate yield of aquifers.	
5	evaluate water requirements of crops and storage capacity of reservoirs.	
6	explain causes and effects of water logging and explain reclamation measures.	
Course Content:		
Unit-I	**Precipitation:** Hydrological cycle, Application of hydrology, Precipitation: Types of precipitation, measurement, Rain gauge network, Preparation of data: estimation of missing data, Presentation of rainfall data-mass rainfall curves, Hyetograph, Point rainfall, Moving average, Mean precipitation over an area: arithmetic mean method, Thiessen's polygon, Isohyetel method, Concepts of depth-area-duration analysis, Frequency analysis - frequency of point rainfall and plotting position, Intensity-duration curves, Maximum Intensity duration- frequency analysis.	**(08 Hours)**
Unit-II	**Abstractions from Precipitation:** Intercepction, Depression storage, Evaporation: Elementary concepts, factors affecting, Measurement of evaporation, Transpiration, Evapotranspiration: Process and measurement, Infiltration: Introduction, Infiltration capacity, Infiltrometer, Horton's method and infiltration indices Stream Gauging: Selection of site, various methods of discharge measurement (velocity-area method, dilution method, slope-area method).	**(08 Hours)**
Unit-III	**Runofff:** Factors affecting runoff, Rainfall-Runoff relationships, Empirical Techniques to determine runoff, Runoff hydrograph- Introduction, Factors affecting Flood Hydrograph, Components of Hydrograph, Base flow separation, Effective rainfall, Unit hydrograph theory, uses and limitations of Unit Hydrograph Floods: Synthetic Unit Hydrograph, Estimation of peak flow, Rational formula and other methods.	**(08 Hours)**
Unit-IV	**Ground Water Hydrology:** Occurrences and distribution of ground water, Specific yield of aquifers, Movement of ground water, Darcy's law, Permeability, Safe yield of basin,	**(08 Hours)**

	Hydraulics of wells under steady flow condition in confined and unconfined aquifers, Specific capacity of well, pumping and recuperation test, Well Irrigation: Tube wells, Open wells and their construction.	
Unit-V	**Crop Water Requirements and Irrigation:** Classes and availability of soil water, Available moisture depth, Frequency of irrigation, Relationship between duty a delta and base period, Factors affecting duty, Methods of improving duty, Irrigation efficiencies, Command areas, Kharif, Rabi and perennial crops, Crop rotation, Irrigation water requirement, Design discharge of canal and storage capacity of reservoir based on irrigation requirement, Types of irrigation,	**(08 Hours)**
Unit-VI	**Water Logging and Lift Irrigation:** Quality of irrigation water, various methods of irrigation, Suitability of various methods of irrigation, Water Logging, Definition, Effects, Causes and remedial measures of water logging, types of land drains, Layout and spacing of tile drains, Salt balance, saline and alkali soils, reclamation and management of salt affected soils. Lift Irrigation, necessity and components.	**(08 Hours)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Delineation of watershed boundary by using Arc GIS.
2	Obtain a rainfall data for given catchment and determine average rainfall by various methods
3	Describe the working of Automatic Weather station.
4	Describe the working of Float type of rain gauge.
5	Recognize infiltration characteristics of different soils by tube infiltrometer.
6	Create Hydrographs of different durations from given flood hydrograph.
7	Identify the design discharge for a given area by various methods.
8	Elaborate the case study on Water logging and Reclamation.
9	Estimate design discharge of canal based on given cropping pattern and command area.
10	Elaborate the case study on drip and sprinkler irrigation.
11	Elaborate the case study of lift irrigation scheme.
12	Compare drip irrigation system Vs conventional irrigation system for a given field.
13	Delineation of watershed boundary by using QGIS.
14	Collection and analysis of rainfall data for a particular region for given time period.
15	Describe of different discharge measurement methods and compare the results.

Textbooks:

1	Subramanya K., "Engineering Hydrology", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1990.
2	Asawa G. L., "Irrigation and water resources Engineering", New Age International Publishers, New Delhi, 2005.
3	Garg S. K., "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi, 1996.

Reference Books:	
1	Chow V. T., Maidment D. R., & Mays L. W., “Applied Hydrology”, McGraw-Hill Book Company, New York, 1988.
2	Raghunath H. M., “Hydrology, Principles, Analysis and Design”, New Age International (P) Ltd, New Delhi, 2000.
3	Michael A. M., “Irrigation Theory and Practice”, Vikas Publishing House, New Delhi, 2004.

Programme: B. Tech. (Civil) Sem – VI (2021)

COURSE: DESIGN AND DETAILING OF REINFORCED CONCRETE STRUCTURES (ITC - IV)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 50 Marks Oral : 25 Marks	Theory: 04 Practical: 02
		Total: 06

Course Pre-requisites: The students should have knowledge of	
1	conditions of equilibrium, shear force and bending moment diagram of beams for various support conditions and load combinations.
2	determination of bending stress and shear stress in beams.
3	concept of short, long columns, direct and bending stress.
4	concrete, concreting techniques and properties of concrete.
5	concepts of planning of staircase, planning and drawing of a building.
Course Objective:	
	The student should be able to complete the design and detailing of a G+2 storey R.C.C. building.
Course Outcomes: The student will be able to	
1	differentiate between various design philosophies and apply Limit State design philosophy.
2	calculate moment of resistance of beam section.
3	design and detail of different types of slabs and staircases.
4	design and detail of beams for flexure, shear, bond for various supporting conditions.
5	design and detail of short columns for axial load, uniaxial and biaxial bending.
6	design and detail of isolated column footings.

Course Content:		
Unit-I	**Materials and Design Approach:** Introduction of R.C.C: Materials: Types of reinforcements, Study of properties of concrete and properties of steel. Introduction to design philosophies of R.C. Structures: Working Stress Method, Ultimate Load method, Limit State Method. Various limit states, Semi-probabilistic approach, Partial safety factors for materials and loads, various structural elements and loads on the elements, Load combinations.	**(08 Hours)**
Unit-II	**R.C. Sections in Flexure:** Limit State Method: Assumptions, Strain variation diagram, Stress variation diagram; Concept of balanced, under reinforced, and over reinforced section; Design parameters of a singly reinforced rectangular section, modes of failure, Moment of resistance of singly reinforced, doubly reinforced, rectangular, singly reinforced flanged section.	**(08 Hours)**
Unit-III	**Slabs:** Design of Slabs: One Way Slabs: Simply supported, Cantilever, and Continuous slabs. Two Way Slabs: Simply supported, Continuous and restrained. Design of Staircase: Dog legged, Open well.	**(08 Hours)**

Unit-IV	**Beams:** Design of Beams for Flexure, Shear, Bond: Behaviour of R.C .beam in shear, Shear failure, Shear strength of beam Without shear reinforcement, Design of shear reinforcement. Bond -Introduction, types of bonds, Codal provision. Design of beams: Simply supported, cantilever, Continuous: Singly reinforced, doubly reinforced and flanged beam. Introduction to Redistribution of moments in beams: Assumption, Requirements of I.S.456-2000. Various load combinations in continuous beams.	**(08 Hours)**
Unit-V	**Columns:** Design of Columns: Axially loaded short columns, requirements of minimum eccentricity; Design of short columns for axial load, uniaxial, biaxial bending using interaction curves (SP 16).	**(08 Hours)**
Unit-VI	**Footings:** Design of Footings: Design of isolated rectangular column footing for axial load, uniaxial Bending. Introduction to combined footing: Concept and types.	**(08 Hours)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project based Learning:

1	Prepare the chart for properties of concrete and steel materials.
2	Prepare the chart for design parameters for balanced section with stress and strain distribution diagrams.
3	Prepare the chart for design parameters for under-reinforced section with stress and strain distribution diagrams.
4	Draw design parameters for by using excel programming for various grades of concrete and steel.
5	Draw design parameters for under-reinforced section by using excel programming.
6	Develop of an excel sheet for calculation of design of one way slab.
7	Develop of an excel sheet for calculation of design of two way slab.
8	Develop of an excel sheet for calculation of design of cantilever slab.
9	Develop of an excel sheet for calculation of design of simply supported beam.
10	Develop of an excel sheet for calculation of design of continuous beam.
11	Develop of an excel sheet for calculation of design of cantilever beam.
12	Develop of an excel sheet for calculation of design of axially loaded column.
13	Develop of an excel sheet for calculation of design of uniaxially loaded column.
14	Develop of an excel sheet for calculation of design of biaxially loaded column.
15	Develop of an excel sheet for calculation of design of foundation.

Practical:

1	Design of G + 2 (residential/commercial/public) storeys building having minimum floor area of 150 m^2 (for gravity loads only). The design should include all types of slabs, beams, columns, footings and staircase (first and intermediate flight).

	Note: Maximum four students in a group and each group should have different design data.
2	Four full imperial drawing sheets.
3	Detailing of reinforcement should be as per SP-34 & IS-13920.
4	Report of a site visit related to building under construction.
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Dr. V. L. Shah & Dr. S. R. Karve, "Limit State Theory and Design", Pune Vidyarthi Griha.
2	Punmia, Jain & Jain, "Comprehensive Design of R. C. Structures", Standard Book House.
3	S. S. Bhavikatti, "Design of R.C.C. Structural Elements", New Age International Ltd.
4	P. Dayaratnam, "Limit State Analysis and Design", Wheeler Publishing Company, New Delhi.
5	P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi.
6	Sinha R.C., "RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi Publications.
Reference Books:	
1	N. Subramanian, "Design of Reinforced Concrete Structures", Oxford University Press.
2	M. Fergusson, "R. C. Fundamentals", Tata McGraw Hill Publication.
3	S. Unnikrishnan Pillai, & Devidas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publication.
4	Dr. H. J. Shah, "Reinforced Concrete -Vol.1 (Elementary Reinforced Concrete)", Charotar Publications.
Codes:	
1	IS 456-2000: Plain and Reinforced Concrete-Code of Practice.
2	IS 875-1987 (Part I to V): Code of Practice for Design Loads.
3	IS 13920-2016: Ductile Design and Detailing of Reinforced Concrete Structures subjected to Seismic Forces.
4	SP 16-1980: Design Aids for Reinforced Concrete.
5	SP 34-1987: Handbook on Concrete Reinforcement and Detailing.

Programme: B. Tech. (Common for All) Sem –VI (2021)

<table>
<tr><td colspan="3">COURSE: QUANTITATIVE TECHNIQUES, COMMUNICATION AND VALUES</td></tr>
<tr><td>TEACHING SCHEME:</td><td>EXAMINATION SCHEME:</td><td>CREDITS:</td></tr>
<tr><td>Theory: 04 Hours / Week</td><td>End Semester Examination: 60 Marks
Internal Assessment: 40 Marks</td><td>Theory: 04</td></tr>
<tr><td></td><td></td><td>Total: 04</td></tr>
</table>

Course Pre-requisites: The students should have knowledge of	
1	basic maths and reasoning, and comprehensive ability.
2	basic knowledge of communication process, soft skills.
3	basic knowledge and idea about leaders and leadership qualities, ethics, etiquettes and values.
Course Objective:	
	The Quantitative Techniques, Communication and Values aims to augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time. The communication and values section focuses on the aspects of communication and soft skills such as grooming personality for leading team, presentation, business communication which would enable graduates to project themselves as a professionals in the corporate sector and/or otherwise.
Course Outcomes: The student will be able to	
1	solve the aptitude test in the recruitment and competitive exam by applying short techniques and solve the question in less amount of time.
2	apply the short mnemonics and techniques to solve the questions of logical reasoning in the placement and competitive exam in lesser time.
3	develop the verbal ability to communicate effectively using suitable vocabulary and proper sentence pattern.
4	explain the concept of soft skills and its implication at workplace.
5	build up the ability to study employment business correspondences and its proper implications.
6	recognize business ethics, etiquettes and values and apply them in the professional ventures.

Course Content:

Unit-I	**Quantitative Aptitude:** Umber system, Percentage, profit and loss, Simple Interest and Compound Interest, Ratio, Proportion and Average, Mixture and Allegation, Time, Speed & Distance, Time & Work , Permutation & Combination, Probability, Pipes and Cisterns.	**(08 Hours)**
Unit-II	**Non-Verbal Reasoning:** Coding, Decoding, Number series, Blood relation Directions, cubes & dices , Data Interpretation, Data Sufficiency, Set Theory & Syllogisms, Matching, Selection & Arrangement, Clocks & Calendars, Visual Reasoning, Input, Output & Flow Chart.	**(08 Hours)**
Unit-III	**Verbal Reasoning:** Sentence Patterns, Sentence correction and spotting errors, Vocabulary, antonyms and synonyms and analogy, Phrasal Verbs, idiomatic expressions, reading comprehension, closest, sentence rearrangement and theme detection.	**(08 Hours)**
Unit-IV	**Self Awareness and Soft Skills Development:** Concept of SWOT, Importance of SWOT, Individual & Organizational SWOT Analysis, Soft skills, meaning, need and importance, difference between soft skills and hard skills, life skills and personal skills, Leadership	**(08 Hours)**

	skills, Importance, Types, Attributes of good leader Motivational theories and leadership ,Emotional intelligence in personal and professional lives its importance need and application, Team Building and conflict resolution Skills, Problem solving skills, Time Management and Stress Management Skills Pareto Principle (80/20) Rule in time management, Time management matrix, creativity and result orientation, working under pressure, stress management.	
Unit-V	**Communication and Honing Employment Skills:** Communication process, Non-verbal codes in communication, importance of LSRW in communication, Barriers to communication, Principles of effective Technical writing, Email writing and Netiquettes, **Letter writing:** formal letters, job application letter, cover letter, structure of technical report writing, Building Resume and CV, Tips to build an effective Resume, Group discussion, Skills required for Group Discussion Interview skills, Ways of handling telephonic interviews, Importance of body language, grooming &etiquettes for getting right impression in PI&GD , Extempore, Introduction to PowerPoint presentation, Structure & flow of presentation.	**(08 Hours)**
Unit-VI	**Business Ethics, Etiquettes and Values:** The Importance of Ethics and Values in Business World, Respect for Individuality and diversity at workplace values of a good manager Key features of corporate etiquette, Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behaviour at the work place, Corporate Social Responsibility (CSR) and its importance and need.	**(08 Hours)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Prepare mock Tests on Unit –I and solve it in given time (use of PSD lab manual).
2	Prepare mock Tests on Unit –I and solve it in given time (use of PSD lab manual).
3	Prepare online model test based on Unit-II and solve it in specific time (use of PSD lab manual).
4	Prepare online model test based on Unit-II and solve it in specific time (use of PSD lab manual).
5	Form a model for spoken and written communication skills which avoid grammar mistakes and common errors.
6	Develop various activity models for enriching and developing vocabulary.
7	Preparing strategies by using SWOT and TWOS analysis.
8	Analysing differences between Soft Skills, Hard skills, and Personal skills.
9	Develop Bruce Tuchman's Team Building Models with classmates/Teammates.
10	To study different personalities of Leaders from various sectors and find out their attributes and success stories.
11	Preparing a model for Time Management Skills and Stress Management and conduct activities for effective implementation of it.
12	Form a model to develop LSRW and communication Skills.
13	Conduct mock interview and practice GD activities to build competencies for actual selection process.

14	Preparing a model for evaluating Values and Ethics of Good Managers.
15	Preparing a model of dress codes and attire for different professional situations Corporate etiquettes and its implications.
16	Develop some good activities to understand the importance and need of Corporate social responsibility (CSR).
Reference Books:	
1	R. S. Agarwal, “Quantitative Aptitude”, S. Chand Publication.
2	Shakuntala Devi, “The Book of Numbers”.
3	R. S. Agarwal, “A Modern Approach To Logical Reasoning”, S. Chand Publication.
4	Indu Sijwali, “A New Approach to Reasoning Verbal & Non-Verbal”.
5	Meenakshi Raman, & Prakash Singh, “Business Communication”, Oxford University Press Publication, Second Edition.
6	Sanjay Kumar, & Pushp Lata, “Communication Skills”, Oxford University Press Publication, Second Edition.
7	Meenakshi Raman, & Sangeeta Sharma, “Technical Communication” Oxford University Press Publication.
8	Krishna Mohan, & Meera Banerji, “Developing Communication Skills” Macmillan India Pvt Ltd Publication.
9	Meenkashi Raman, “Soft Skills”, Cengage Publication.
10	Dr. K. Alex, “Soft Skills”, Oxford University Press Publication.
11	Dr. T. Kalyana Chakravarthi & Dr. T. Latha Chakravarthi, “Soft skills for Managers”, Biztantra Publication.

Programme: B. Tech Civil Sem –VI (CBCS-2021)

Course: PROJECT ESTIMATION AND VALUATION

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours/Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 50 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of

1	Building Planning and Design.
2	Advanced Surveying with Geomatics.
3	Planning & Management of Construction Projects.
4	Infrastructure and Transportation Systems.
5	Limit State Design of Steel Structures.

Course Objectives:

The aim of this course is to prepare the students to make estimate of building, road, and other civil engineering structures.

Course Outcomes: The student will be able to

1	execute approximate estimate of structures.
2	execute quantities of different types of items of work.
3	explain specification with reference to different types of materials.
4	execute rate analysis for different types of structures.
5	execute abstract and build of different items of work for constructions.
6	calculate value of building and land.

Course Content:

UNIT - I	**Estimation:** Purpose of estimating and valuation, Types of estimates, types of estimates, data required for estimates, units of measurement & principles deciding the units, mode of measurement of building works, Abstracting, bill of quantities. Provisional & prime cost items, contingencies, establishment charges, centage charges, Schedule of rates (D. S. R.).	**(08 Hours)**
UNIT - II	**Methods of Taking out Quantities:** Long Wall-Short Wall Method and Centre Line method of taking out quantities for different items of building. Estimation of quantity of load bearing structures, Preparing Detailed Estimates of quantity single storied residential building, Preparing Detailed Estimates of quantity Different R.C.C. members, Preparing Detailed Estimates of water supply and sanitary works, Estimation of quantity of culverts and bridges, Methods of estimate of earthwork for roads, canals, Estimation of quantity of Trusses. IS Codes used for estimating. Calculating quantities using MS Excel.	**(08 Hours)**
UNIT - III	**Specifications:** Definition & purpose, Objectives and importance of specification, types, standard specifications, Specification of works, Drafting detailed specifications with reference to materials, quality, workmanship, method of execution, mode of measurement and payment, for major items such as earthwork, stone/brick masonry, plastering, ceramic tile flooring, R.C.C.	**(08 Hours)**

	work.	
UNIT - IV	**Rate Analysis:** Purpose, importance and requirements of rate analysis, Prerequisites, factors affecting rate analysis, overhead expenses, procedure for rate analysis, schedule of rates, Task work: Labor requirement for different works, material requirement for different works, Rate analysis of different Items of work.	**(08 Hours)**
UNIT - V	**Abstracting and Billing:** **Abstracting:** Purpose of abstract, Preparation of abstract, Measurement and billing, Checking of bills and final bills. **Billing:** Maintenance of muster role, Preparation of pay bill, Measurement of work for payment of contractors. Introduction to HIT-Office Software.	**(08 Hours)**
UNIT - VI	**Valuation:** Purpose, nature of value, price, cost and value, types of value, Factors affecting value of property. Concept of free hold and lease hold property, Depreciation & methods of working out depreciation, Sinking fund, Years Purchase, Out goings. Methods of Valuation of Building: Land & building basis, Rental basis, Reproduction & replacement cost basis.	**(08 Hours)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning: Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code/proof for it, wherever applicable.

1	Prepare approximate estimate of load bearing and framed structure.
2	Prepare approximate estimate for construction of septic tank.
3	Prepare detailed estimate for 3 storey framed structure.
4	Prepare a detailed estimate for construction of a road of 500m length.
5	Estimation of quantity of Trusses required for an industrial shed.
6	Prepare detailed specifications for different materials required for construction of residential structure.
7	Prepare rate analysis for different types of construction works.
8	Prepare abstract and bill for different types of construction activities.
9	Prepare valuation report of different types of structures.
10	Calculate Valuation of residential and commercial building based on rental method.
11	Prepare detailed estimate for pipe culvert.
12	Prepare detailed estimate for box culvert.
13	Prepare detailed estimate for industrial shed.
14	Prepare detailed estimate for bridge.
15	Carry out valuation for land and building.

Term Work: (Any Six)

1	Estimation of residential building using long wall & short wall method and centre line method.
2	Detailed estimate of a single storied RCC framed building using D.S.R. rates.
3	Estimation of quantity of culverts and bridges.

4	a) Detailed estimate of canal work. b) Assignment on road earthwork calculations.
5	Draft detailed specifications of any five items of work.
6	Assignment on Abstracting and Billing.
7	Prepare Detailed Rate analysis for any five items of work.
8	Carryout detailed valuation on different types of buildings.
9	**Project I:** Calculating quantities of different items using MS excel.
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	B. N. Dutta, "Estimating and Costing in Civil Engineering: Theory and Practice", S. Dutta & Company Publication, Lucknow.
2	B. S. Patil, "Civil Engineering Contracts & Estimates", Orient Longman Ltd. Publication Mumbai.
3	B. N. Dutta, "Estimating and Costing in Civil Engineering", USB Publishers Pvt. Ltd. New Delhi, ISBN:9788174767295.
4	S. C. Rangwala, "Estimating and Costing", Charotar Publishing House Pvt. Ltd., 2011.
Reference Books:	
1	Rangwala, "Estimating and Costing", Charotar Publishing House Pvt. Ltd.
2	M. Chakraborty, "Estimating, Costing Specifications & Valuation in Civil Engineering", M. Chakraborty Publication.
3	G. S. Birdie, "Estimating Costing", Dhanpat Rai Publishing New Delhi, 2016.
4	V. K. Raina, "Construction Management and Contracts", Shroff Publishers & Distributors New Delhi.
Codes:	
1	I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.

Programme: B. Tech Civil Sem –VI (CBCS-2021)

Course: CONTRACTS AND E-TENDERING (Vocational Course-IV)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS**
Practical: 02 Hours / Week	Term work: 25 Marks Oral: 25 Marks	Practical: 01
		Total: 01

Course Pre-requisites: The students should have knowledge of		
1	Building Planning and Design.	
2	Planning & Management of Construction Projects.	
3	Infrastructure and Transportation Systems.	
4	Project Estimation and Valuation.	
Course Objectives:		
	The objective of this course is to prepare the students to understand and use provisions made in Indian Contracts Act, read tender notice ad file E-Tender.	
Course Outcomes: The student will be able to		
1	explain definition and essentials of a valid contract.	
2	explain contract formation and conditions of contracts.	
3	describe Indian Contract Act 1872 and provisions made in the act.	
4	execute E-Tendering and Manual Tendering.	
5	execute procedure for Civil contractor license for various departments.	
6	explain tender notice and file E-Tender.	
Course Content:		
UNIT - I	**Contracts:** Definition, objective & essentials of valid contract, Types of contracts, FIDIC document, Standard forms of contracts, Contract formation, Conditions of contracts, Methods of inviting tenders, Pre-bid meetings, Pre-qualification system, scrutiny of tenders and comparative statement, Contract performance, Contract correspondence and contract closure.	**(08 Hours)**
UNIT - II	**Indian Contract Act (1872):** Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. Contract formation, Contract performance, Valid excuses for non-performance, Breach of contract, Effects of breach: understanding the clauses and applying them to situations/scenarios on construction projects.	**(08 Hours)**
UNIT - III	**Introduction to E-Tendering:** Basic Concept of Tender, Difference between E-Tendering and Manual Tendering, Various normal contract terms and condition comes under tendering process, Registration as Contractor-Process of Civil Contractor license for various Departments, Data or tools require for E-Tender Filling, Tender Searching, Documentation for E-Tendering, E-Tender Filling Process.	**(08 Hours)**
Term Work: (Any Six)		
1	Collect essential documents for lump sum and item rate contract.	
2	Collect and prepare a note on FIDIC documents.	

3	Write a brief summary on procedure of opening of tenders.
4	Write a brief report on Indian Contract Act 1872.
5	Prepare report on tender filling procedure by taking one sample tender.
6	Write a brief summary on procedure of opening of tenders.
7	Write a brief note of license process for various departments.
8	Preparing report on BOT type contract works executed at nearby location.
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	B. S. Patil, "Civil Engineering Contracts and Estimates", Universities Press- 2006 Edition, reprinted in 2009.
2	B. N. Dutta, "Estimating and Costing in Civil Engineering", USB Publishers Pvt. Ltd. New Delhi.
3	S. C. Rangwala, "Estimating and Costing", Charotar Publishing House Pvt. Ltd., 2011.
4	"The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006", Professional Book Publishers.
Reference Books:	
1	The Workmen's Compensation Act, 1923 (8 of 1923) Bare Act- 2005, Professional Book Publishers.
2	Standard General Conditions for Domestic Contracts- 2001 Edition- Published by Ministry of Statistics and Program Implementation, Government of India.
3	International Federation of Consulting Engineers (FIDIC) Document (1999).
4	G. S. Birdie, "Estimating Costing", Dhanpat Rai Publishing New Delhi, 2016.
5	V. K. Raina, "Construction Management and Contracts", Shroff Publishers & Distributors, New Delhi.

Programme: B. Tech. (Civil) Sem – VI (2021)

COURSE: MOOCs-II			
TEACHING SCHEME:		**EXAMINATION SCHEME:**	**CREDITS:**
			Total: 02
Course Pre-requisites: The students should have basic knowledge of			
1	Engineering subjects.		
Course Objective:			
	To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Course to all the students. It will provide an affordable and flexible way to learn new skills, advance the career and deliver quality education experiences at scales.		
Course Outcomes: The student will be able to			
1	execute e-learning through online web and video courses in Engineering.		
2	develop self–learning approach.		
3	develop platform for knowledge enhancement as per their area of interest.		
4	value themselves with advanced technologies.		
5	make the students for more employable.		
6	develop themselves for competitive exams like GATE and also for higher studies.		
Methodology of Assessment			
1	Department shall publish list of NPTEL courses in every semester. Student can refer any one of them in respective semester.		
2	Keeping pre-requisite in mind, proposed curriculum has provided with the various subject baskets as per the course available		
3	Students need to enrol for the course in each academic year as mentioned in the structure		
4	Students need to attend all online lectures and complete all assignments on time for registered course.		
5	Students will register and appear for exam conducted by NPTEL and shall submit the copy of course completion certificate received after passing the exam for registered course		
6	Accordingly , the credits will be allocated to the students for respective MOOCs Program to earn the credits of respective MOOCs		
7	NPTEL course relevant to respective branches related to your past and present semester are only expected to select by students , credits will not be awarded if general/ non engineering courses opted		
8	To get continuous assessment marks students have to show progress which is based on the assignment submitted by you- submit print of progress report of course to concerned faculty		
Assignments: Submit all assignment to the department coordinator with progress which is shared by **Swayam/MOOCs faculty conducting course.**			

Programme: B. Tech. (Civil) Sem – VII

COURSE: FOUNDATION ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory:04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Statics and Dynamics
2	Geomechanics
3	Fluid Mechanics
4	Construction and Material
Course Objective: On completion of the course -	
	Students can apply the knowledge about the analysis and design of different types of foundations.
Course Outcomes: On completion of the course, the students will be able to:	
1	summarize the principles and methods of subsurface exploration.
2	evaluate the bearing capacity of shallow foundation.
3	identify the concept of settlement and consolidation in soils.
4	compute the capacity of pile and pile group.
5	analyse problems related to black cotton soil and use design principle and construction techniques in black cotton soil to solve them.
6	choose the appropriate soil stabilisation technique based on site conditions.

Course Content:

Unit-I	**Subsurface Investigation:** Purpose and necessity of soil exploration, reconnaissance, methods of soil exploration – open excavation, auger boring, wash boring, percussion drilling, depth and number of explorations, soil sampling: types of samples, types of sampler, area ratio, inside and outside clearance, recovery ratio, geophysical method :-seismic reflection method and electrical resistivity method, field testing:- SPT, DCPT, SCPT and its correlation is code provisions, bore logs and preparation of soil investigation report.	**(06 Hrs)**
Unit-II	**Bearing Capacity:** Introduction and Definitions, different types of shear failure, Terzaghi's bearing capacity theory, Meyerhof's bearing capacity: - rectangular, square and circular,Effect of factors on bearing capacity:- Size and Shape, depth and Water table,Guidelines of BIS (IS 6403) for estimation of bearing capacity, Field tests for bearing capacity calculation:- Plate load test, SPT.	**(06 Hrs)**
Unit-III	**Settlement and Consolidation:** **Settlement:** Introduction, causes of settlement, Uniform and Non-Uniform settlement, significant depth of foundation, Pressure bulb, Contact pressure distribution diagram, Permissible limit of settlement **Consolidation:** Introduction and Basic Definitions, Spring analogy, Terzaghi's 1-D consolidation theory, Laboratory consolidation test, Determination of coefficient	**(06 Hrs)**

	of consolidation by square root of time fitting method and Logarithm of time fitting method.	
Unit-IV	**Pile Foundation:** Classification of pile, Pile Installation method, Load carrying capacity of piles: - Statics and Dynamic method, Engineering News formula, Modified ENR formula. . Pile load test, Static and Cyclic pile load test. Group action-Feld rule, Rigid block method. Settlement of pile group in cohesive soil by approximate method. Micro piles.	**(06 Hrs)**
Unit-V	**Shallow Foundation & Foundation on Black Cotton Soils** **Shallow Foundation:** types and applications, Principles of design of footing, steps involved in proportioning of footing, proportioning of combined footing-rectangular and trapezoidal footing, raft foundation- types. **Foundation on Black cotton Soils: -**Characteristics of black cotton soil, swelling potential and its evaluation methods, engineering problems, foundations on black cotton soil: design principles, construction techniques, under reamed piles: design principles and its construction techniques.	**(06 Hrs)**
Unit-VI	**Ground Improvement Techniques-** Soil Stabilization: Introduction, Objectives, Method of Soil Stabilisation, Cement Stabilization, Lime Stabilisation, Bitumen Stabilisation, Chemical Stabilisation, Injection stabilisation: Grouting, Use of Geosynthetic material in ground improvement.	**(06 Hrs)**

Internal Assessment:

Unit Test -1	Unit No: - I, II, III
Unit Test -2	Unit No: - IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	To prepare of a brief report on standard Penetration test of soil as per IS code IS2131- 1981
2	To prepare of a brief report on soil investigation report.
3	To prepare chart on geophysical method of soil investigation.
4	To prepare demonstrate model of mode of shear failure.
5	To Prepare chart on derivation of Terzaghi's Bearing Capacity equation.
6	To prepare of a brief report on plate load test for determination of bearing capacity of soil
7	To prepare demonstrate model of spring analogy of consolidation.
8	To Prepare chart on derivation of Terzaghi's 1-D Consolidation equation.
9	To prepare chart on square root of time fitting method and Logarithm of time fitting method
10	To prepare PPT on classification of Pile foundation.
11	Compare the different methods of load carrying capacity of pile foundation.
12	To prepare demonstrate model of well foundation.
13	To prepare demonstrate model of under reamed pile foundation.
14	To prepare chart on different types of geosynthetics.
15	To prepare PPT on different method of soil stabilization.
16	Application of python for calculation of bearing capacity of soil.
17	Application of python for calculation of load carrying capacity of pile foundation.

Reference Books:	
1	A.K.Arora, “Soil Mechanics and Foundation Engineering”, Standard Publishers.
2	B.C. Punmia, “Soil Mechanics and Foundation Engineering”, Laxmi Publication.
3	Dr. P.N. Modi, “ Soil Mechanics and Foundation Engineering” Rajsons Publications Pvt. Ltd.
4	Gopal Ranjan, A.S.R., “Basic and Applied soil mechanics”, New Age International Publishers
5	N.V. Nayak, “Foundation Design Manual”, Dhanpat Rai and Sons
6	Braja M. Das, “fundamentals of Geotechnical Engineering”
7	V.N.S. Murthy, “Advanced Foundation Engineering”, CBS Publishers and distributors.
Codes:	
1	IS2131- “Method for Standard Penetration Test for Soils”, Bureau of Indian Standards.
2	IS 8403 “Code of Practice for Determination of Breaking Capacity of Shallow Foundations”, Bureau of Indian Standards.
3	IS1888:“Methods of load test on soils”, Bureau of Indian Standards.

COURSE: ELECTIVE I -ADVANCED CONCRETE TECHNOLOGY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 03 Practical: 01
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Concrete Technology

Course Objective: On completion of the course -

The students should be able to understand advanced applications of composite materials.

Course Outcomes: On completion of the course, the students will be able to -

1	design the concrete mix using fiber reinforced composites.
2	design the self compacting concrete.
3	identify the possible use of ferro-cement concrete in construction industry.
4	describe the benefits of use of silica fume in concrete.
5	identify and use the polymer and light weight concrete for different constructions.
6	Estimate cost of different types of concrete.

Course Content:

Unit-I	**Fiber Reinforced Composites:** Introduction to Fiber Reinforced Concrete, Types of fibers, Properties of fibers. Properties of constituent materials. Mix proportion, Mixing, Casting methods.	**(06 Hrs)**
Unit-II	**Self-Compacting Concrete:** Design and manufacture of Self compacting concrete, High performance concrete, Very High Strength Concrete, High Density Concrete, Fresh properties of self-compacting concrete.	**(06 Hrs)**
Unit-III	**Ferro-Cement:** Introduction, Materials used, Mechanical properties, Construction techniques, Applications, and Merits as structural materials.	**(06 Hrs)**
Unit-IV	**Silica Fume Concrete:** Introduction, Physical and chemical properties of silica fume, Reaction mechanism of silica fume, Properties of silica fume concrete in fresh state.	**(06 Hrs)**
Unit-V	**Polymer and Light Weight Concrete:** Introduction, Classification, Properties of Polymer and lightweight concrete.	**(06 Hrs)**
Unit-VI	**Economical Aspect:** Cost analysis of different types of concrete, Selection of suitable type of concrete.	**(06 Hrs)**

Internal Assessment:

Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it	
1	Prepare the chart for various types and properties of fibers.
2	Develop of an excel sheet for calculation of mix design using fiber reinforced composites
3	Prepare the chart for design and manufacture of self-compacting concrete
4	Develop of an excel sheet for calculation of mix design for self-compacting concrete
5	Develop of an excel sheet for calculation of mix design for very high strength concrete
6	Develop of an excel sheet for calculation of mix design for high density concrete
7	Prepare the chart for various types of meshes used for construction of ferro-cement
8	Prepare the chart for various applications of ferro-cement
9	Prepare the chart for physical and chemical properties of silica fume
10	Prepare the chart for reaction mechanism of silica fume
11	Prepare the chart for properties of silica fume concrete in fresh state
12	Develop of an excel sheet for calculation of mix design for silica fume concrete
13	Develop of an excel sheet for calculation of mix design for polymer concrete
14	Prepare the chart for classification of light weight concrete
15	Develop of an excel sheet for calculation of mix design for light weight concrete
16	Compare Cost of different types of concrete
17	Suggest suitable type of concrete as per site requirements
18	Case study of economical aspect of a typical project.
Term work: (Any four)	
1	Mix design and testing of fiber reinforced composites concrete for split-tension and flexure.
2	Mix design and testing of fresh properties of Self Compacting Concrete
3	Mix design and testing of panels of ferro-cement
4	Mix design and testing of cubes of silica fume concrete
5	Mix design and testing of cubes of polymer concrete
6	Mix design and testing of cubes of light weight concrete
7	Mix design and cost comparison of different types of concrete.
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	M. S. Shetty, “Concrete Technology”, S.Chand Publication.
2	R. N. Swamy, “Concrete Technology & Design” Surrey University Press.
3	Rafal Siddique, “Special Structural Concretes”, Galgotia Publication Pvt. Ltd. New Delhi
4	P. N. Balaguru, S. P. Shah, “Fiber Reinforced Cement Composites” McGraw Hill Publication.
5	D. J. Hannant, “Fiber Cement and Fiber Concrete” John Wiley and Sons Publication.
6	Bhusan L. Karihal, “Fracture Mechanics and Structural Concrete”, John Wiley and Sons Publ.
Codes:	
1	IS 10262: Indian Standard code of practice for Guidelines for concrete mix proportioning, Bureau of Indian Standards, New Delhi.
2	ACI PRC-237-07 Self-Consolidating Concrete.
3	ACI 549.1R-18 Design Guide for Ferro-cement.

4	IS 15388: Specification for Silica Fume.
5	ACI PRC-548.1-09: Guide for the Use of Polymers in Concrete.
6	ACI 211.2-98 Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

COURSE: ELECTIVE I : URBAN WATER MANAGEMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 3 Hours / Week Practical: 2 Hours / Week	End Semester Examination: 6Marks Internal Assessment: 40 Marks Term work:25 Marks Oral: 25 Marks	Theory: 03 Practical: 01
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Physics, Chemistry, Mathematics and Statistics
2	Ecology, Hydrology, Environment and Climate Change
3	Water Engineering and Management
Course Objective:	
	An urban water management is to provide safe drinking water, handling wastewater for the maintenance of public health, protect against floods, along with alleviating the effects of pollution.
Course Outcomes: The student will be able to	
1	Understand how cities are growing and changing which is leading to describing the promise of Integrated Urban Water Management (IUWM)
2	Focus on the implications of these changes for urban water resources: in the past, water security efforts focused on water quantity and understand how new concerns about water quality are now emerging.
3	Understand and design the new tools and strategies to shift from urban water management to IUWM.
4	Gain insight that how UWM can contribute to cities' resilience in the face of climate change and analyze changing climate demanding water management be approached in a different way
5	Understand, apply and develop an enabling environment for the change toward a framework for integrated urban water management.
6	Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities.

Course Content:

Unit-I	**Introduction to Urban Water management**	**(6 hours)**
	Introduction to Urban Water Management (UWM): Concept, Need, The changing urban context, Expanding city limits, Consequences of globalization and Urbanization, Urban-Rural Conflicts, Special challenges for some cities	
Unit-II	**Water resources and urbanization**	**(6 hours)**
	Water: Sources, Quantity and Quality, Wastewater: Sources, Quality and Reuse , Effects on Water Demand due to Urbanization, Water Cess Act, Water(Prevention and Control) Act 1974	
Unit-III	**UWM tools and management strategies**	**(6 hours)**
	Storm water management, Water reclamation and reuse, Water audits and efficient use, Flexible and adaptable urban water systems, Tariffs, payments and other economic tools, Benefit Cost Ratio for Urban Water	

	Management	
Unit-IV	**Climate Change Challenge**	**(6 hours)**
	Climate Change: Introduction, Cause and Consequences, Climatic Variations in India in recent years, Effect of Climate change on Water Resources and Sanitation, Urban contributions to climate change, Response options , Resilience to climate change	
Unit-V	**Conventional and Integrated Urban Water management**	**(6 hours)**
	Conventional Urban Water Management: Introduction, Present Scenario, Advantages and Disadvantages, Integrated Urban Water Management (IUWM): Introduction, Need, Advantages, Urban water governance, Application of IUWM for SMART CITY	
Unit-VI	**framework for integrated urban water management**	**(6 hours)**
	Role of Central and Local governments, Involvement of Private sector, Business opportunities and Employment Enhancement, Participation of NGO's and Stakeholder, Sustainable Development and Practices	

Internal Assessment:

Unit Test -1	I,II,III
Unit Test -2	IV,V,VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Design poster on - new concerns about water quality are now emerging.
2	Study and Write Report on water resources of city/town/villageyou belong to
3	Power Point Presentation on Case study of urban water management
4	Prepare model of IUWM for city/town/village
5	Design chart on comparison of IUWM with Conventional method
6	Carryout water audit of your house and write report with suggestions
7	Design model for rain harvesting for your home
8	Power Point Presentation on Tools of UWM

Practical:

1	Collection of data how cities are growing and changing describing the promise of IUWM
2	Study of urban water resources: in the past and how new concerns about water quality are now emerging.
3	Design new tools and strategies to shift from Conventional urban water management to IUWM
4	Study and data collection of climate change and analyze changing climate demanding water management to be approached in a different way
5	Design framework for integrated urban water management for Existing and Futuristic SMART Cities
6	Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities to foster a new culture of urban water management
7	Field Visit and Report on SMART City and/or Township in India and/or abroad
8	Suggest suitable plan for a city to be smarter with respect to UWM

Oral:

The oral examination will be based on above term work and course content.

Textbooks:	
1	Urban Water Engineering and Management by Mohammad Karamouz, Ali Moridi, Sara Nazif, January 20, 2010 by CRC Press Textbook, ISBN 9781439813102 - CAT# K10665
2	Municipal Stormwater Management, Second Edition by Thomas N.Debo, Andrew Reese, November 25, 2002 by CRC Press, Reference –1176, ISBN 9781566705844 - CAT# L1584
3	Integrated Urban Water Management: Humid Tropics: UNESCO-IHP by Jonathan N. Parkinson, Joel AvruchGoldenfum, Carlos Tucci, March 26, 2010 by CRC Press, Reference – 180, ISBN 9780415453523 - CAT# K10165, Series: Urban Water Series
4	The Economics of Sustainable Urban Water Management: the Case of Beijing: UNESCO-IHE PhD Thesis by Xiao Liang, September 28, 2011 by CRC Press, Reference – 200, ISBN 9780415691734 - CAT# K13927
5	Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations by HolgerTreidel, Jose Luis Martin- Bordes, Jason J. Gurdak, December 2, 2011 by CRC Press, Reference – 414, ISBN 9780415689366 - CAT# K13833, Series: IAH – International Contributions to Hydrogeology
6	Metropolitan Sustainability: Understanding and Improving the Urban Environment Edited by F Zeman, Royal Military College of Canada,
7	Integrated Urban Water Management By AkiçaBahri, Global Water Partnership Technical Committee (TEC), TEC BACKGROUND PAPERS, NO. 16, ISBN: 978-91-85321-87-2
8	Good Practices in urban water management: Decoding good practices for a successful future edited by Chiplunkar, Anand, KallidaikurichiSeetharam, and CheonKheong Tan, Mandaluyong City, Philippines: Asian Development Bank, 2012, ISBN 978-92-9092-740-2 (Print), 978-92-9092- 741-9 (PDF)
9	Integrated Urban Water Management for Planners By John Y. Whitler and Jennifer Warner, Water Research Foundation, PAS Memo —September/October 2014, American Planning Association, 205 N.Michigan Ave., Ste. 1200, Chicago, IL 6060

COURSE: ELECTIVE I- HUMAN RESOURCES MANAGEMENT

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hrs. / Week Practical :02 Hrs./Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks TW: 25 Marks Oral : 25 Marks	Theory : 03 Practical: 01
		Total : 04 Credits

Course Pre-requisites: The students should have knowledge of

1	Project Management
2	Engineering Economics Management

Course Objective: On completion of the course -

	To develop the skill of human resource management in construction industry.

Course Outcomes: On completion of the course, the students will be able to -

1	appraise the significance of human resources in construction industry.
2	arrange human resources.
3	identify the recruitment and selection process.
4	discuss the significance of training and development of employees.
5	analyze the employee benefits and incentives.
6	describe employee management relations.

Course Content:

Unit-I	**Introduction** History of HRD, Objectives, Functions, HRD in Construction Industry, Status of Construction Labour.	**(06 Hrs)**
Unit-II	**Human Resource Planning** Formulating Human Resource Plans, Various Methods, Job Analysis, Job Specifications and Job Design in Construction Projects, Forecasting Personal Needs and Supply in Construction Sector.	**(06 Hrs)**
Unit-III	**Recruitment & selection** Selecting Project Manager & Project Team, External & Internal Recruitment. Data Gathering Methods, Skill Requirement of Construction Personnel.	**(06 Hrs)**
Unit-IV	**Training & Development** The Training Process, Individual and Organizational Development, Change Management, Performance Appraisal, Use of Performance Appraisal Information, Establishing The Evaluation System, Performance Management / Encouragement, Rewarding Employees	**(06 Hrs)**
Unit-V	**Employee Benefits** Employee Health and Safety, Wage and Salary Administration, Incentive System, Wages of Construction Industry, Retirement and Pensions.	**(06 Hrs)**
Unit-VI	**Employee Management Relations** Collective Bargaining, Effective Ways of Working, Trade Unions Act, Labour Welfare Act, Payment Of Wages Act ,Workers Compensation Act ,Contract Labour Act, Management Of Conflicts.	**(06 Hrs)**

Internal Assessment:

	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV,V,VI
Project Based Learning: Any ONE based on following topics but not limited to it		
1.	Prepare chart / presentation on functions of human resource development in construction industry.	
2.	Prepare chart / presentation on various methods for formulating human resource plans	
3.	Prepare chart / presentation on selection of project manager and project team.	
4.	Prepare chart / presentation on skill requirement of construction personnel.	
5.	Prepare chart / presentation on performance appraisal in construction industry.	
6.	Prepare chart / presentation on employee health and safety issues : Management Policy	
7.	Prepare chart / presentation on benefits of incentive systems to employees.	
8.	Prepare chart / presentation on different laws for employee management relations	
Term work:- Assignments based on Case studies of following but not limited to		
1.	Case study of HRD in construction industry	
2.	Formulating human resource plan	
3.	Case study of external and internal recruitment	
4.	Report on establishing evaluation system for performance appraisal	
5.	Importance on Employee benefits	
6.	Report on conversation with HR of any construction industry	
Oral:-		
	The oral examination will be based on above term work and course contents	
Reference Books:		
1	Biswanath Ghosh, "Human Resource Development and Management" Vikas Publishing House Pvt. Ltd	
2	S.C. Agarwal, "Human Resource Management" Dhanpat Rai Publications	
3	C.B. Mamoria, "Personnel & Human resource Management" , Himalaya Publishing House	
4	Subbarao," Human resource management", Himalaya Publishing House	
5	K. Aswathappa, "Human Resource Management" , TMH Pvt. Ltd	
IS Codes		
	Code of ETHICS by Society of Human Resources Management	

COURSE: ELECTIVE I-ENVIRONMENTAL IMPACT ASSESSMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 3 Hours / Week Practical: 2Hours / Week	End Semester Examination: 60Marks Internal Assessment: 40Marks Term work:25 Marks Oral: 25Marks	Theory: 03 Practical: 01
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1.	Basic Knowledge of Physics, Chemistry and Mathematics
2.	Basic Knowledge of Environmental Science
3.	Basic Knowledge of Statistics and Computers
Course Objective:	
	To learn the purpose and aims of EIA as well as EIA administration and practice thereby undertaking an EIA projects by understanding of the strengths and limitations of EIA with the costs and benefits of undertaking EIA
Course Outcomes: The student will be able to	
1.	Appreciate the purpose and role of EIA in the decision-making process and understand the strengths of EIA in regard to environmental management;
2.	Understand the technical and social/political limitations of EIA
3.	Understand the screening process and the scoping process and how it is applied
4.	Know the options for estimating environmental and social impacts and the format of an EIA Report (Environmental Impact Statement, or Environmental Statement);
5.	Appreciate the factors that assist, and detract, from the usefulness of the EIA Report
6.	Understand the purpose of developing follow-up procedures, and the options for designing these procedures.

Course Content:		
Unit-I	**Environmental Impact Assessment EIA**	**(6Hours)**
	EIA: Background, Introduction, Purpose and aims of EIA, Nature and Scope of environmental issues and impacts, Principles of EIA administration and practice, Key elements of the EIA process, Costs and benefits of EIA, EIA Policy and Legislation, EIA Requirements of International Organizations, Principles for a Functional EIA System	
Unit-II	**Screening and Scoping**	**(6Hours)**
	Screening: Introduction, Screening procedure, Project lists for screening, Preliminary EIA, Screening Basics, Other types of Screening, Criteria for the determination of the need for, and level of, EIAScreening Exercise, **Scoping**: Introduction, Purpose of scoping, Approaches to scoping, Scoping methods, Scoping Basics, Alternatives and tiering, Scoping in Practice	
Unit-III	**Impact analysis and EIA Methods**	**(6Hours)**
	Implications of the widening environment and sustainability agenda, Impact Identification, Impact Analysis/Prediction, Impact Analysis Basics, Characteristics of environmental impacts, Impact	

	Characterization, Social Impact Assessment, Evaluation of impact significance, Significance Criteria, Impact Significance Assessment, Interaction Matrix and Simple Checklist Methods, Development of a Simple Matrix, Observations on Simple Matrices, Simple Checklists	
Unit-IV	**Mitigation and Impact Management**	**(6Hours)**
	Link between EIA process and Mitigation, Main Elements of Mitigation, Mitigation Basics, Approaches to Mitigation, Mitigation of Specific Impacts, Environmental Management Plan and Mitigation Measures, Impact Assessment and Mitigation, Public involvement: Introduction, Principles of public involvement, Scope of involvement, Planning a public involvement programme, Public involvement techniques, Arguments for and against public involvement, Stakeholders involved	
Unit-V	**EIA Reporting and Review of EIA Quality**	**(6Hours)**
	EIA Report, Typical Elements of an EIA Report, EIA Reporting Basics, Shortcomings encountered in Preparing EIA Reports, Guidelines for effective EIA report preparation and production, The Non-Technical Summary/Executive Summary, EIA Reporting Practice, Role and Purpose of the EIA Review Process, Need for a Systematic Approach, Procedural Aspects, Main Steps in the EIA Review, EIA Quality Basics, Carrying out the review, EIA Report Quality Assessment Exercise, Procedures for Evaluating EIA Reports	
Unit-VI	**Decision-making, Implementation and Follow-up**	**(6 Hours)**
	Role of the Decision-makers, EIA as part of the Decision-making Process, Decision-making: Procedural Considerations, Responsibility of the Decision-Makers, Key Objectives of EIA implementation and follow up, Tools for Environmental Management and Performance Review, Monitoring, Implementation Management Planning, Environmental Auditing, EMP and Audit Programme, Evaluation of EIA Effectiveness and Performance, Introduction to ISO 14000 Series.	

Internal Assessment:

Unit Test -1	I.II,III
Unit Test -2	IV,V,VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Draw flow chart of EIA for Road Project
2	Draw flow chart of EIA for Industrial Project
3	Draw flow chart of EIA for Township Project
4	Design Chart on Mitigation measures for Sugar industry
5	Design Chart on Mitigation measures for Dairy industry
6	Design Chart on Mitigation measures for Pulp and Paper industry
7	Write Executive Summery for Road Project
8	Write Executive Summery for Township Project
9	Power Point Presentation on Environmental Audit

10	Power Point Presentation on Case Study
11	Small Report on Case Study
Practical:	
1	The ways that a project might be modified through the EIA process
2	Legislative protections on a proposed development site in India
3	Some of the problems and advantages having the developer responsible for preparing the EIA documents
4	EIA Challenges especially in developing countries
5	Project of State Significance in India and what role does it play in the Indian system
6	Inventorisation of the natural resources available in India
7	Power Point Presentation on Case study undergone EIA
8	Site visit
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Environmental Impact Assessment: A Practical Guide, Betty Marriott - 1997
2	Environmental impact assessment, Larry W. Canter - 1977
3	Introduction to Environmental Impact Assessment, John Glasson, RikiTherivel, Andrew Chadwick - 2013
4	Environmental Impact Assessment, Stephen Tromans - 2012
5	Environmental Impact Assessment: Practice and Participation, Kevin Hanna - 2015
6	Environmental Impact Assessment: A Methodological Approach, Richard K. Morgan - 1999
7	Methods of Environmental Impact Assessment, Peter Morris, RikiTherivel – 2001
8	Environmental Impact Assessment: A Guide to Best Professional Practices, Charles H. Eccleston - 2011
9	Introduction to Environmental Impact Assessment, John Glasson, RikiTherivel, Andrew Chadwick – 2005
Reference Books:	
1	Ackland A, Hyam P and Ingram H (1999) *Guidelines for Stakeholder Dialogue â€" A Joint Venture*. The Environment Council, London.
2	*African High-Level Ministerial Meeting on Environmental Impact Assessment (EIA) Durban, South Africa*. Communique (1995) issued by UNEP, Nairobi.
3	Ashe J and Sadler B (1997) Conclusions and Recommendations. In *Report of the EIA Process Strengthening Workshop*. (pp.109-118). Environment Protection Agency, Canberra.
4	Au E and Sanvicens G (1997) *EIA Follow up and Monitoring in Report of the EIA Process Strengthening Workshop* (pp. 91-107). Environment Protection Agency, Canberra
5	Australian and New Zealand Environmental and Conservation Council (ANZECC) (1996) *Guidelines and Criteria for Determining the Need for and Level of Environmental Impact Assessment in Australia*. Working Group on National Environmental Impact Assessment,

	ANZECC, Canberra
6	Bass S, Dalal-Clayton B and Pretty J (1995) *Participation Strategies for Sustainable Development*. IIED, London.
7	Boyle J and Mubvami T (1995) *Training Manual for Environmental Impact Assessment in Zimbabwe*. Department of Natural Resources, Ministry of Environment and Tourism, Zimbabwe.
8	Brown A (1998) The Environmental Overview as a Realistic Approach to Strategic Environmental Assessment in Developing Countries. In Porter A and Fittipaldi J (eds) *Environmental Methods Review: Retooling Impact Assessment for the New Century*, pp. 127-134. The Press Club, Fargo, USA
9	International Association for Impact Assessment (IAIA) and the Institute of Environmental Management and Assessment (IEMA) (1999) *Principles of EIA Best Practice*. IAIA, Fargo, North Dakota. (http:/www.iaia.org/publications)
10	Institute of Environmental Management & Assessment (1999), *Draft Guidelines on Public Participation in Environmental Decision Making*. Institute of Environmental Management & Assessment, Lincoln, UK

COURSE: ELECTIVE –I GREEN CONSTRUCTION PRACTICES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03Hours / Week Practical: 02Hours / Week	End Semester Examination: 60Marks Internal Assessment: 40Marks Term work: 25Marks Oral: 25Marks	Theory: 03 Practical: 01
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Environmental engineering
2	Sustainable energy sources & their applications
3	Building construction & materials

Course Objective: On completion of the course -

The students will be able to realize the importance of implementation of green construction in construction industry because in green construction practices mainly the emphasis is given on optimum use of natural resources along with its today's need & requirement.

Course Outcomes: On completion of the course, the students will be able to -

1	describe the Definition, Concept & importance of green building, along with their benefits & techniques used.
2	Enumerate & apply conceptual knowledge about green design & summarize the rating system of green building
3	apply construction techniques in Green Building construction.
4	get the knowledge about material conservation and the role of air quality in green construction practice.
5	Summarize the need & demand of sustainable energy, and its importance in application of solar energy utilization in green construction practices.
6	Summarize the need & importance of water energy in green construction.

Course Content:

Unit-I	**Introduction to Green Building:** Definition of Green Building, Importance of Green Building, Characteristics of Green Building, Principles of Green Building, Benefits of Green Building, Techniques to be applied in Green Building, Scope of Green Buildings in India, Zero Energy Building (ZEB)	**(06 Hrs)**
Unit-II	**Green Design & Rating System:** **Design:** 3 Pillars of Sustainability - (Environmental, Economical & Social), Principles Of Sustainable Development In Building Design, Characteristics of Sustainable Buildings, Sustainably managed Materials, Integrated Lifecycle design of Materials and Structures (Concepts only), **Rating System:** Launch of Green Building Rating Systems, BREEAM, LEED, GREEN STAR, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings, Purpose, Key highlights, Point System with Differential weightage, Benefits given by Municipal Corporation to Green Building.	**(06 Hrs)**
Unit-III	**Green Building Construction Techniques:** Features of Green Building, key Requisites for Constructing a Green	**(06 Hrs)**

	Building, Building Simulation Analysis: - four 'R's & Green Techniques, Structural Techniques, Electrical Techniques, Special Techniques, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, Green Composites for Buildings Concepts of Green Composites, Non Mechanized Practices & Importance.	
Unit-IV	**Material Conservation & Air Quality:** **Material Conservation:** Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. **Air Quality:** Indoor Environment Quality and Occupational Health, Air conditioning, Indore air quality, Sick building syndrome, Minimum fresh air requirements avoid use of asbestos in the building, Improved Fresh Air Ventilation, Measure of IAQ, IAQ depend on factors: List of Materials, their impacts & preventive measures and or alternate options to reduce the impacts.	**(06 Hrs)**
Unit-V	**Sustainable Energy Utilization Practice :** Need of Energy, Reduction in Energy Demand, Onsite Sources and Sinks, Maximise System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Utility of Solar Energy in Buildings Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling.	**(06 Hrs)**
Unit-VI	**Water Efficiency:** Need of Water Efficiency, Importance of EP-Act of 1992, Low Energy Approaches to Water Management. Flush and flow fixture water usage measurement, Importance Of Reducing Indoor, Outdoor and Process Water Use, strategies to reduce indoor & Outdoor water use, Means & Strategies of use of water.	**(06 Hrs)**

Internal Assessment:

Unit Test -1	Unit No. I,II,III
Unit Test -2	Unit No. IV,V,VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare a informative chart of green building.
2	Prepare a building model showing the concept utilization of green construction.
3	Prepare a report on sustainable building.
4	Prepare a chart showing the information about Building Simulation Analysis.
5	Prepare a model on water harvesting system.
6	Prepare a model on solar energy /lighting system.
7	Prepare a chart showing colorful pictures of various green construction materials.
8	Prepare a model on grey water management System.
9	Case studies of Solar Passive Cooled and Heated Buildings.
10	Prepare model on soil erosion control techniques.
11	Collect the samples of various natural and renewable materials, materials with recycled content, waste and salvaged materials etc.

Term work: The term work shall consist of **ANY SIX** following practical-	
1	Design water harvesting system for institution / a building.
2	Design waste water reuse system for institution.
3	Design Solar Energy conservation system for institution.
4	Design green waste treatment system for the institution.
5	Planning & Design the energy Conservation for the building or institution
6	Application of Green Roof System design to the building.
7	Rules & Regulation of Green Building at national level.
8	Rules & Regulation of Green Building at international level
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	Harhara Iyer G, "Green Building Fundamentals", Notion Press.
2	Dr. Adv. Harshul Savla, Green Building: Principles & Practices
	Tomwoolley and Samkimings "Green Building Handbook".
3	"Handbook on Green Practices" published by Indian Society of Heating Refrigerating and Air conditioning Engineers.
4	Trish Riley, "Complete Guide to Green Buildings".
5	Kent Peterson, "Standard for the design for High Performance Green Buildings".
6	D. R. Wulfinghoff "ENERGY EFFICIENCY MANUAL".
7	IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
8	GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
9	K.S. Jagadish, B.V. Venkatarama Reddy and K. S. Nanjunda Rao, "Alternative building materials and technologies"
10	G. D. Rai, "Non-Conventional Energy Resources", Khanna Publishers.
11	"Sustainable Building Design Manual", Vol.1 and 2, TERI, New Delhi.
12	Mike Montoya, "Green Building Fundamentals", Pearson, USA,.
13	Charles J. Kibert, "Sustainable Construction – Green Building Design and Delivery", John Wiley& Sons, NewYork,.
14	Regina Leffers, "Sustainable Construction and Design", Pearson / Prentice Hall, USA.
Reference Codes:	
1.	Delaware's Code for Energy Conservation
2.	National Model Energy Codes
3.	International Energy Conservation Code (IECC)
4.	International Green Construction Code (IGCC)

COURSE:ELECTIVE I- DOCKS, PORTS & HARBOURS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hrs. / Week Practical :02 Hrs./Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks TW: 25 Marks Oral : 25 Marks	Theory : 03 Practical: 01
		Total : 04 Credits

Course Pre-requisites: The students should have knowledge of	
1	Fluid Mechanics
2	Advanced Surveying (Hydrographic Survey)

Course Objective: On completion of the course	
	The student will demonstrate knowledge of different marine structures and their design considerations.

Course Outcomes: On completion of the course, the students will be able to -	
1	illustrate importance of Ports in Economy and International trade .
2	analyze the wave, tide and the phenomenon related to the same
3	explain the requirements of an ideal port & harbour
4	design the different harbour works.
5	explain the port planning process
6	analyze marine pollution.

Course Content:

Unit-I	**Introduction to Ports and Harbours:-** History, Development of Port and Ship Construction Technology along with International Trade, Port Development – Indian Scenario	**(06 Hrs)**
Unit-II	**Waves and Tides:-** Concept of Generation, Propagation and Form of Wave in Coastal Zone, Global Tide Phenomenon, Types of Tides, Concept of Wave Tranquillity, Resonance, Coastal Sediment Transport, Types of Ports	**(06 Hrs)**
Unit-III	**Ports and Harbours:-** **Harbour:** Classification, Facilities and Structures, Approach Channel, Marker Buoys, Breakwater Layout, Berth and Jetties, Bulk Oil Container **Ports**: Loading Unloading, Storage, Customs and Relevant Facilities, Security, Hospital Colony, Associated Services, Maintenance Facilities, Dry Docks, Slipway, Locks.	**(06 Hrs)**
Unit-IV	**Marine Structures:-** General Design Aspects, Breakwaters - Function, Types, General Design Principles, Wharves, Quays, Jetties, Piers, Pier Heads, Dolphin, Fenders, Mooring Accessories- Function, Types, Suitability, Design And Construction Features.	**(06 Hrs)**
Unit-V	**Port Planning:-** Modernization of Port, Lifting and Loading Unloading (RO-RO) Facilities, Computerization, Automation, Berth Occupancy, Port Cost Analysis, Dredging and Disposal Technology	**(06 Hrs)**
Unit-VI	**Port Development:-** Role of Port Development and National Policy, Public And Private	**(06 Hrs)**

	Sector, Marine Pollution and Environmental Aspects.	
Internal Assessment:		
	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI
Term Work		
1.	Assignment on Port Development An Indian Scenario	
2.	Assignment on types of tides and their generation.	
3.	Assignment on Environmental aspects of port development.	
4.	Assignment on port cost analysis.	
5.	Assignment on suitability of different marine structures.	
6.	Assignment on design of breakwaters.	
7.	Assignment on Coastal Sediment Transport.	
Oral:		
	The oral examination will be based on above term work and course content.	
Project Based Learning: Any ONE based on following topics but not limited to it		
1	Prepare chart / presentation on history of ports in India.	
2	Prepare chart / presentation on importance of ports in Indian Economy.	
3	Prepare chart / presentation on importance of ports in International Trade.	
4	Prepare chart / presentation on types of ports.	
5	Prepare chart / presentation on facilities and structures in harbour.	
6	Prepare chart / presentation on types of marine structures.	
7	Prepare chart / presentation on dredging in ports.	
8	Prepare chart / presentation on marine pollution.	
Reference Books:		
1	R.L.Wiegel, "Oceanographic Engineering" , Prentice –Hall	
2	R. Silvester, "Coastal Engineering" , Vols. 1 and 2 , Elsevier Scientific Publishing Co.	
3	R.M.Sorenson, "Basic Coastal Engineering", J.Wiley & Sons	
4	H.P.Oza and G.H.Oza, "Docks and Harbour Engineering" , Charotar Publishing	
5	S.P.Bindra, "A Course in Docks and Horbour Engineering" , Dhanpat rai Publications	
IS Codes:		
1	IS 9527: (Part 6)	
2	IS 10020: (Part 4)	

COURSE: ELECTIVE I- GROUND WATER HYDROLOGY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 3 Hours / Week Practical: 2 Hours / Week Tutorial:-	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 3 Practical: 1 Tutorial:
		Total: 4

Course Pre-requisites: The students should have knowledge of	
1	Fluid Mechanics
2	Hydrology and Irrigation
Course Objective: on completion of the course	
	Course attempts to provide knowledge and skills for effective ground water management
Course Outcomes: The student will be able to	
1	Describe utilization of ground water, its origin and rock properties.
2	Derive ground water flow equations
3	Describe different types of flow in different aquifers and different yield tests.
4	Describe the sources and causes of ground water pollution.
5	Demonstrate various methods of Exploration of ground water.
6	Describe various methods of artificial ground water recharge and intrusion of saline water.
Course Content:	

Unit-I	**Ground water utilization**: Ground water utilization & historical background, ground water in hydrologic cycle, ground water budget, ground water level fluctuations & environmental influence, rock properties affecting groundwater, groundwater column, zones of aeration & saturation,	(06 Hours)
Unit-II	**Aquifers and their characteristics:** Aquifers and their characteristics/classification, groundwater basins & springs, Darcy's Law, permeability & its determination, Dupuit assumptions, heterogeneity &anisotropy, Ground water flow rates & flow directions, general flow equations through porous media.	(06 Hours)
Unit-III	**Ground Water Flow:** Steady, uniform, radial flow to a well in a confined, unconfined aquifer, well flow near aquifer boundaries/ for special conditions, partially penetrating, horizontal wells & multiple well systems, well completion, development, protection, rehabilitation, testing for yield.	(06 Hours)
Unit-IV	**Ground Water Pollution and Quality:** Municipal, industrial, agricultural ,miscellaneous sources & causes of pollution, , physical, chemical ,biological analysis of ground water quality, criteria & measures of ground water quality, ground water salinity & samples,	(06 Hours)
Unit-V	**Ground Water Exploration:** Geological, geophysical exploration, remote sensing , electric resistivity, seismic refraction based methods for surface investigation of ground water, test drilling & ground water level measurement, sub-surface ground	(06 Hours)

	water investigation through geophysical , resistivity	
Unit-VI	**Ground Water Recharge:** Concept & methods of artificial ground water recharge, recharge mounds & induced recharge, wastewater recharge for reuse, water spreading. Saline water interface, upcoming of saline water, saline water intrusion control.	(06 Hours)

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare a report on Case studies with reference to rock properties affecting ground water.
2	Prepare a report on Case studies with reference to ground water fluctuations.
3	Prepare a report on different types of aquifer and their characteristics .
4	Prepare a report on well development and well protection.
5	Prepare a report on testing for yield of the wells.
6	Prepare a report on sources and causes of ground water pollution.
7	Prepare a report on physical, chemical and biological analysis of ground water quality .
8	Prepare a report on Case studies with reference ground water exploration using geophysical methods.
9	Prepare a report on Case studies with reference ground water exploration by remote sensing methods.
10	Prepare a report on Case studies with reference ground water exploration by using electrical resistivity method.
11	Prepare a report on Case studies with reference various methods of artificial recharge of ground water.
12	Prepare a report on Case studies with reference various sea water intrusion.

Practical will consist of following Assignments

1	Determination of specific yield of an aquifer
2	Use of flow net for ground water studies
3	Problems on pumping test method.
4	Assignment on method of images
5	Assignment on different types of wells
6	Assignment on ground water quality for industrial use and domestic use.
7	Visit to nearby ground water harvesting structure and prepare a report.
8	Problems on well hydraulics
9	Assignment on ground water exploration techniques.
10	Assignment on Design of wells

Oral:

	The oral examination will be based on above term work and course content.

Reference Books :

1	Dr. P.N.Modi, Irrigation Water Resources and Water Power Engineering , Standard Book House 2012
2	H.M. Raghunath, Ground Water hydrology,
3	D.K. Todd and L. F. Mays,"Groundwater Hydrology", John Wiley and sons
4	Literature of Central Ground Water Board

<table>
<tr><td colspan="3">COURSE:ELECTIVE-I: ETHICS FOR CIVIL ENGINEERS</td></tr>
<tr><td><u>TEACHING SCHEME:</u></td><td><u>EXAMINATION SCHEME:</u></td><td><u>CREDITS:</u></td></tr>
<tr><td>Theory: 03 Hours / Week
Practical: 02 Hours/ Week</td><td>End Semester Examination: 60 Marks
Internal Assessment: 40 Marks
Term work: 25 Marks
Oral: 25 Marks</td><td>Theory: 03
Practical: 01</td></tr>
<tr><td></td><td></td><td>Total: 04</td></tr>
</table>

Course Pre-requisites: The students should have knowledge of		
1	Construction Design & Drawing	
2	Arbitration and Laws related to Construction Industry.	
3	Quantitative Techniques, Communication and Values.	
Course Objective: On completion of the course -		
	The students to imbibe and internalize the values and ethical behavior in the personal and professional lives.	
Course Outcomes: On completion of the course, the students will be able to -		
1	comprehend the importance of values and ethics.	
2	identify the principles of Engineering Ethics and Ethical terms.	
3	analyze the Ethical Theories	
4	apply the Professional Practices in Civil Engineering.	
5	assess the Safety and Risk in Ethical terms	
6	recognize the Global issues.	
Course Content:		
Unit-I	**Morals, Values, and Ethics:** Integrity, Work ethic, Service learning, Civic virtue, Respect for others, living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Character, Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.	**(06 Hrs)**
Unit-II	**Code of Ethics for Engineers:** First principles of Engineering Ethics & Ethical terminology, Social Values, Character, considerations for general Individuals, Engineers & the Society, Recommendations of the Professional bodies (Code of Conduct).	**(06 Hrs)**
Unit-III	**Senses of 'Engineering Ethics':** Variety of moral issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Models of professional roles, Theories about right action, Self-interest, Customs and Religion, Uses of Ethical Theories.	**(06 Hrs)**
Unit-IV	**Professional Practices in Engineering:** Profession: Definition and Characteristics, Relation of an Engineer with Client, Contractor and Fellow Engineers, Professional and Norms of Professional Conduct, Norms of Professional Conduct vs Profession; Responsibilities, Obligations and Moral values in Professional Ethics,Ethics inlimits of predictability and responsibilities of engineering profession.,	**(06 Hrs)**
Unit-V	**Safety and Risk:** Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk,	**(06 Hrs)**

	Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Professional Rights, Employee Rights, Introduction to Copyright, IPR (Intellectual Property Right), Plagiarism & Legal issues.	
Unit-VI	**Global Issues:** Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Moral Leadership, Corporate Social Responsibility.	**(06 Hrs)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare a report on Morals, values, and Ethics.
2	Prepare a report on and PPT on Introduction to Yoga and meditation for professional excellence and stress management
3	Prepare a report on first principles of Engineering Ethics.
4	Prepare a report on Recommendations of the Professional bodies (Code of Conduct).
5	Prepare a detailed report on first principles of Engineering Ethics & Ethical terminology.
6	Prepare a detailed report and PPT on senses of 'Engineering Ethics'.
7	Prepare a detailed report and PPT on Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory.
8	Prepare a detailed report and PPT on uses of Ethical Theories.
9	Prepare a detailed report and PPT on responsibilities, Obligations and Moral values in Professional Ethics.
10	Prepare a detailed report and PPT on limits of predictability and responsibilities of engineering profession.
11	Prepare a detailed report and PPT on Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk.
12	Prepare a detailed report and PPT on Introduction to Copyright.
13	Prepare a detailed report and PPT on IPR (Intellectual Property Right).
14	Prepare a detailed report and PPT on Plagiarism & Legal issues.
15	Prepare a detailed report and PPT on Global Issues.

Term work: The term work shall consist of any EIGHT following practical-

1	Study of various Work ethics and Commitment.
2	Write a report and PPT on Empathy and Self Confidence.
3	Write brief report on various Ethical terminology.
4	Write a report and PPT on Social Values in Code of Ethics.
5	Study of variousEthical theories about right action.
6	Study of variousProfessional Practices in Civil Engineering.
7	Write a report and PPT onRelation of an Engineer with Client, Contractor and Fellow Engineers

8	Write a report and PPT onProfessional Rights.
9	Write a report and PPT onenvironmental Ethics.
10	Write a report and PPT onCorporateSocial Responsibility.
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	R.Subramanian, "Professional Ethics" Oxford University Press.
2	Caroline Whitbeck, "Ethics in Engineering Practice & Research", Cambridge University Press.
3	Mike W. Martin and Roland Scherzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi.
4	Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi.
5	John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi.
6	Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd., New Delhi.

COURSE: ELECTIVE -I AIR & NOISE POLLUTION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hours / Week Practical: 02Hours / Week	End Semester Examination: 60Marks Internal Assessment: 40Marks Term work: 25Marks Oral: 25Marks	Theory: 03 Practical: 01
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Environmental Engineering

Course Objective: On completion of the course -

The students will be able to impart knowledge on the sources, effect and control techniques of air pollutants and noise pollution.

Course Outcomes: On completion of the course, the students will be able to -

1	acquire general understanding of quality of air and impact on local and global effects of air pollution on human, materials, properties and vegetation.
2	characterize the Scales & unit of air pollution, Air pollution episodes, Air quantity criteria and Air Quality standards, emission standards
3	know Meteorology, Meteorological parameters, meteorological data for atmospheric stability and air pollutant transport and dispersion
4	summarize sampling methods& the various types of air pollution control equipment
5	Get information about Air pollution monitoring systems, Legislation and enforcement, EIA, Air pollution control Act and strategy for effective control of air pollution.
6	Interpret the general of meaning, sources& effects of noise pollution also the acts of noise pollution

Course Content:

Unit-I	**Sources and effects of Air Pollution:** Definition, sources of air pollution- Natural and Artificial, types and classification of air pollutants, Primary and Secondary air pollutants and their importance, Effects of air pollution on –Human, Animals, Materials and Vegetation. Global Effects-Photochemical smog, heat island, ozone depletion, acid rain.	**(06 Hrs)**
Unit-II	**Air Pollution Measurement & Standards:** Scales of Air Pollution, Units of Measurement, Quantity and Composition of Gaseous and Particulate Pollutions, Air Pollution Episodes, Air quantity criteria and Air Quality standards, Ambient Air Quality standards and emission standards, .	**(06 Hrs)**
Unit-III	**Meteorology And Air Pollution:** Scales of Meteorology, Meteorological Parameters, Stability of Atmosphere & Temperature Lapse Rate, Plume Behaviour, Inversion Phenomena, Vertical Stability Of Atmosphere, Precipitation, Wind Patterns, Direction, Velocity and Fluctuations, Gaussian Diffusion Model for Finding Ground Level Concentration, Mixing Heights, Determination Of Stack Height.	**(06 Hrs)**
Unit-IV	**Air Pollution Sampling, Control Equipment and Methods :**	**(06 Hrs)**

	devices And Methods Used For Sampling Of Gases And Particulates, Ambient Air And Stack Sampling, Stack Emission Monitoring For Particulate And Gaseous Matter, Equipment For Ambient Air And Stack Sampling, Principles Of Particulate Removals, Removal Methods Of Particulate, Various Types of Particulate Control Equipment, Settling Chamber, Cyclone Separators, Scrubbers, Fabric Filters and Electrostatic precipitators. General Control of Gaseous Pollutants,	
Unit-V	**Air Pollution Acts & Monitoring Strategies :** Air Pollution Monitoring And Regularity Control, Ambient Air Quality Standards, Preventive Measures, Air Pollution Control Efforts, Zoning, Town Planning Regulation Of New Industries, Legalisation And Enforcement, Environmental Impact Assessment And Air Quality, Air Pollution Control Act And Strategy For Effective Control Of Air Pollution.	**(06 Hrs)**
Unit-VI	**Noise Pollution :** Sources Of Noise Pollution, Effects Of Noise Pollution, Human Diseases Caused By Noise Pollution, Control Of Noise Pollution, Units And Measurements Of Noise–Standard, Noise Pollution Act 2000.	**(06 Hrs)**

Internal Assessment:

Unit Test -1	Unit No: I,II,III
Unit Test -2	Unit No: IV, V,VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare a chart / presentation on sources of air pollution & Effect of air pollution.
2	Prepare a chart / presentation on Classification of air pollutants.
3	Prepare PPT on concept of air pollution.
4	Prepare a chart / presentation on air quality standards and emission limits as per zones.
5	Collect the information of air pollution standards of your city.
6	Prepare the information chart on town planning regulation of new industries.
7	Prepare the information chart on Legislation (**Air Pollution Acts)** and enforcement of air Pollution.
8	Prepare a Model for any type of particulate control equipment.
9	Prepare a chart / presentation on new installations of pollution monitoring equipment.
10	Prepare chart on Sources, effect & control of noise pollution.
11	Prepare PPT on Noise pollution Act 2000.

Term work: The term work shall consist of **ANY SIX** following practical-

1	Determination of particulate matter by PM $_{2.5}$ sampler.
2	Determination of NOx.
3	Determination of Sox.
4	Determination of noise level at certain location by using Digital Sound Level Meter.
5	Site visit specifically to ‘Chimney’ – Stack dispersion.
6	Site visit to industry to understand the working of control equipment of air pollution. (Electro-static precipitator).
7	Measurement of Construction site noise pollution by Digital Sound Level Meter.

8	Measurement of Construction site air pollution.
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	

1.	C. S. Rao, “Environmental Pollution Control Engineering”, Wiley Eastern Limited.
2.	Louis Theodore, Burley Intuscence “Air Pollution Control Equipment”.
3.	CD Cooper and FC. Alley Wairland, “Air Pollution Control” Press III.
4.	Noel de Nevey, “Air Pollution Control Engineering”, – McGraw Hill.
5.	M. N. Rao, H. V. N. Rao, “Air pollution”, Tata McGraw Hill Pvt Ltd, New Delhi.
6.	Dr. Y. Anjaneyulu, “Air Pollution and Control Technologies”, Allied publishers Pvt. Ltd.
7.	H.C Parkins, Air Pollution Mc Graw Hill Publication
8.	Wark Kenneth and Warner C.F, “Air pollution its origin and control”. Harper and Row Publishers, New York,.
9.	Rao C.S., “Environmental pollution control engineering”, New age international Ltd, New Delhi,.
10.	Peavy, H.S., Rowe, D.R., Tchobanoglous, G. “Environmental Engineering”, McGraw Hills, New York.
11.	De Nevers, N., “Air Pollution Control Engineering”, McGraw Hill, New Delhi.
12.	Rao M. N., “Air Pollution”, Tata Mc-Graw Hill Publication
13.	H.S. Peavy, D.R. Row & G. Tchobanoglous, “Environmental Engineering”, Mc Graw Hill International Edition.
14.	Martin Crawford, “Air Pollution Control Theory”, TMH Publ.

COURSE: ELECTIVE I – PLANNING OF SMART CITIES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03Hrs / Week Practical: 02Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks Term Work: 25 Marks Oral: 25 Marks	Theory: 03 Practical: 01
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Construction Design and Drawing
2	Building Byelaws and Regulations
3	Urban Planning
Course Objective: On completion of the course -	
	The students will study the concept and process of smart city planning
Course Outcomes: On completion of the course, the students will be able to -	
1	understand concept and necessity of smart city planning.
2	examine the core challenges due to urbanization.
3	learn models of 21st century green and smart cities.
4	understand current international strategies relating to the foundation of sustainable smart cities.
5	develop knowledge, understanding and application of smart city planning.
6	develop the critical thinking related to smart, sustainable urban development.

Course Content:

Unit-I	Introduction, Concept of Smart City, Components of Smart Cities, Initiative by the government of India, Need of today, Benefits of Smart Cities	**(06 Hrs)**
Unit-II	Evolution of cities up to the present day: social, political and spatial planning models, Urbanization and its impacts on cities, Urban evolution in India, Changing patterns of urban growth, Quality of life in the city.	**(06 Hrs)**
Unit-III	Efficiencies and inefficiencies in cities; challenges and opportunities, Eco challenges in the contemporary cities; Principles of green and smart cities; International initiatives including UN and EU level; Corporate social and environmental strategies in cities;	**(06 Hrs)**
Unit-IV	Fundaments of sustainable development; Sustainability and "sustainable development, Climate change indicators and their meaning for cities; Mobility and transportation within urban areas; Green technologies in cities; Green buildings and ecological footprint, Green Infrastructure, Urban sustainability foundations, models, & theories	**(06 Hrs)**
Unit-V	Role of local authorities and public participation in shaping the cities; Liveability, place making and Walk-ability; City services: utilities (water, energy and communications), public street lighting, roadways and traffic, public transport, signage, environmental quality, waste and sewage management, maintenance.	**(06 Hrs)**
Unit-VI	Study of the existing cities, finding problems and how far they are solvable, Designing for Smart cities, Design, development and exhibition of a feasible innovation project which will enrich citizens and the city through all its phases: determining the scope, defining the idea, establishing objectives,	**(06 Hrs)**

	identifying partners, selecting and acquiring tools and knowledge, planning and presentation, beginning to put the project into practice, Budgetary allocation.	

Internal Assessment:

Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare a poster on 'Components of smart Cities'.
2	Prepare a power point presentation on 'Need of Smart City Planning in India'.
3	Prepare a poster on 'Impact of Urbanization on Cities'.
4	Prepare a power point presentation on 'Quality of life in cities'.
5	Prepare a power point presentation on international initiatives for challenges in cities.
6	Prepare a model of green city.
7	Prepare a poster on 'Sustainable Development' in cities.
8	Prepare a model of 'Waste Management' in Smart Cities.
9	Prepare a power point presentation on 'Need for public participation in shaping the cities'.
10	Case study of 'Smart City' and prepare a power point presentation on it.

Term work: The term work shall consist of **any SIX** following practical-

1	Case study of 'Smart City Planning' in detail and prepare the report
2	To study and prepare report on smart materials for smart buildings
3	Case study of 'Green Building' in detail and prepare the report
4	To study the problems urbanization and its impact on quality of life
5	Case study of 'e – governance' in detail and prepare the report
6	To study the traffic problems in metro cities and address the solutions
7	To study and prepare a report on 'Smart Transport systems for Smart Cities'
8	Site visit of Smart City and prepare a report
9	Model preparation on Smart City

Oral:

The oral examination will be based on above term work and course content.

Reference Books:

1	Annapurna Shaw ," Indian cities " Oxford India ,2012
2	B. Gallion, S. Eisner , "The Urban Pattern", Van Nostrand Reinhold Company,2003
3	ITPI, " City and Metropolitan Planning & Design" ITPI, New Delhi
4	How Green is Cities? By Dimitri Devuyst, Colombia University Press, New York
5	Sustainability Science and Engineering Vol 1, By Martin A. Abraham (editor) Elsevier Publication
6	www.smartcitiescouncil.com
7	City Region 2020, by Joe Ravetz, Earthscan Publication Ltd, London, 2000.

COURSE: INDUSTRY TAUGHT COURSE – V-WASTE WATER TREATMENT AND MANAGEMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 4 Hours / Week Practical: 2 Hours / Week	End Semester Examination: 60Marks Internal Assessment: 20 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of	
1.	Engineering Chemistry
2.	Engineering Mathematics
3.	Microbiology
4.	Mechanics of fluids
Course Objective:	
1	To understand the basics of waste water treatment
2	To gain thorough knowledge on primary, secondary and Advanced treatment of waste water treatment
3	To get employability in ETP and STP
Course Outcomes: The student will be able to	
1.	Use the concept related to sewage, sewer, storm water, etc in its hydraulic design
2.	Study of Primary Treatment and Secondary Treatment
3.	Take-up functional planning, layout and design of sewage treatment plant components.
4.	Study of Advanced Waste water treatment.
5.	Analyze the industrial waste water for understanding its characterization.
6.	Plan for Waste Water reclamation and reuse

Course Content:

UNIT - I	**General Aspects of Environmental Engineering**	**(8 Hours)**
	General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade)	
UNIT - II	**Primary Treatment**	**(8 Hours)**
	Characteristics of sewage – Physical, Chemical, Biological. Introduction to unit operations and unit processes. Primary Treatment –Preliminary and Primary treatment- screen, grit chamber, oil & grease removal, Primary settling tank.	
UNIT - III	**Secondary Treatment**	**8 Hours)**
	Activated sludge process: Theory and design of ASP, sludge volume index, sludge bulking & control, modifications in ASP. Trickling filter: Biological principle, different T.F media & their characteristics, design of standard rate and high rate filters , single stage & two stage filters, recirculation, ventilation, operational trouble, control measures, process of sequencing batch reactor(SBR) and membrane bioreactor (MBR).	

UNIT - IV	**Advanced Waste water and Sludge treatment**	**(8 Hours)**
	Methods, principles and process description. Membrane filtration, Gas stripping, lon exchange, Advanced Oxidation Process (AOP): Sewage water treatments systems-STP-principle and unit process. Principles of anaerobic digestion, stages of digestion, bio-gas production its characteristics and application, factors governing anaerobic digestion, Theory, Process and design of sludge drying bed. Advances in sludge treatment and disposal and nutrient removal.	
UNIT - V	**Industrial waste water treatment and Management**	**(8 Hours)**
	Methods of sampling. Equalization and neutralization. Application of preliminary, primary and secondary treatment for industrial wastewater as per the CPCB norms. Sources of waste water generation from manufacturing process, characteristics of effluent, different methods of treatment & disposal of effluent for the following industries: Sugar, dairy and Pulp and Paper. Discharge standards as per CPCB norms.	
UNIT - VI	**Water reclamation and reuse**	**(8 Hours)**
	Water reclamation technologies – process flow diagrams; Agricultural and landscape irrigation; ground water recharge with reclaimed water – ground water recharge guidelines; Risk assessment for water reuse, Industrial water reuse: Cooling tower makeup water, zero discharge, Case study of waste water management.	

Internal Assessment:

Unit Test -1	Unit I,II,III
Unit Test -2	Unit IV,V,VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Hydraulic Design of Sewers
2	Characterization of sewage sample collected by the students.
3	Power Point Presentation on Working of Sewage treatment Plants
4	Collection of information - Advances in sludge treatment and disposal.
5	Layout of ETP of Sugar, Pulp and Paper, Dairy Industries (Case studies)
6	Design and drawing of septic tank for hostel
7	Prepare chart on useful micro-organisms in waste water treatment
8	Case studies – Recycle and reuse of treated waste water and write report
9	Power Point Presentation Water reclamation and reuse
10	Prepare model of single Pipe system
11	Prepare model of double Pipe system
12	Prepare model of Sewage Treatment Plant
13	Prepare model of Effluent Treatment Plant
14	Collect information of River Pollution of your city/town/village
15	Write a report on the manner waste water handled in your city/town/village

Practical (Any Eight)

1	Determination of Solids –Total solids, suspended solids, volatile solids, settleable solids &non

	settleable solids
2	Determination of Dissolved oxygen
3	Determination of Bio-Chemical Oxygen Demand
4	Determination of Chemical Oxygen Demand
5	Determination of Electrical Conductivity
6	Determination of Phosphates by spectrophotometer
7	Determination of Nitrates by spectrophotometer
8	Visit to domestic / Industrial wastewater treatment plant & its detailed reports
9	Application of Arc Gis in Environmental Engineering
10	Selection of Site for sewage treatment plant by using Arc Gis
11	Determination of Sludge Volume Index
12	Design of ETP/STP using software
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Waste Water Treatment & Disposal – Metcalf & Eddy - TMH publication
2	Environmental Engg. - Peavy, Rowe - McGraw Hill Publication.
3	Waste Water Treatment – Rao & Dutta
4	Environmental studies by Rajgopalan- Oxford University Press
5	Waste Water Engg. – B.C. Punmia& Ashok Jain - Arihant Publications
6	Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication
7	Industrial Waste Water Treatment- A.D.Patwardhan Publication – PHL Learning Private Limited.
8	Water Supply And Wastewater Engineering – B S N Raju- McGraw Hill Publication.
9	Waste Treatment Plants-C.A.Sastry Narosa Publication
Reference Books:	
1	Environmental Engg. – Davis - McGraw Hill Publication
2	Water Supply & Waste Water Engg.- B.S.N. Raju – TMH publication
3	Resources i) http://nptel.iitm.ac.in/courses-contents/IIT Kanpur and IIT Madras. ii) http://cpcb.nic .in iii) http://moef.nic .in
4	P.N.Modi,Sewage Treatment & Disposal & Waste Water Engineering, Rajsons Publications,2015

COURSE: ADVANCED DESIGN OF STRUCTURES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of	
1	Design and Detailing of Reinforced Concrete Structures
2	Analysis of Determinate and Indeterminate Structures
3	Mechanics of Solids
Course Objective: On completion of the course -	
	The students should be able to design advanced structures in Reinforced Cement Concrete and Prestressed Concrete.
Course Outcomes: On completion of the course, the students will be able to -	
1	calculate stresses in prestressed girder in flexure.
2	design a prestressed girder.
3	design the flat slab using I.S. code method.
4	design T and L shaped cantilever retaining wall.
5	design rectangular combined footing.
6	design circular and rectangular water tank resting on ground using I.S. code method.

Course Content:

Unit-I	**Introduction to Prestressed Concrete Structures:** Introduction to prestressing, Basic definitions and terms related to pre stressing, Concepts of prestressing, Materials used, Various methods of prestressing, analysis of P.S.C. beam for flexure.	**(06 Hrs)**
Unit-II	**Losses and Design of P.S.C. Beam:** Concept of losses, Calculation of various losses. Design of Prestressed simply supported beams of rectangular and flanged cross sections, design for flexure and shear only, check for deflection, Design should confirm to the latest version of I.S. 1343.	**(06 Hrs)**
Unit-III	**Design of Flat Slabs:** Concept of flat slabs, Design of flat slabs using latest I.S. Codes.	**(06 Hrs)**
Unit-IV	**Design of Retaining Walls:** Design of cantilever retaining walls- T and L shaped, for all loading conditions as per latest I.S. codes.	**(06 Hrs)**
Unit-V	**Design of Combined Footing:** Design of slab type rectangular combined footing for two columns only. Concept of beam- slab type footing.	**(06 Hrs)**
Unit-VI	**Design of Water Tanks:** Design of circular water tank resting on ground using latest version of I.S. 3370.	**(06 Hrs)**

Internal Assessment:	
Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI
Project Based Learning: Any ONE based on following topics but not limited to it	
1	Prepare the chart for difference in pre tensioning and post tensioning.
2	Prepare the chart for various methods of prestressing.
3	Prepare the chart for various types of losses.
4	Develop of an excel sheet for calculation of design of types of stresses induced in member due to initial loading of prestressing.
5	Develop of an excel sheet for calculation of design of types of stresses induced in member due to final loading of prestressing.
6	Prepare the chart for concept, types, advantages and disadvantages of flat slabs.
7	Develop of an excel sheet for calculation of design of a flat slab.
8	Prepare the chart for concept, types, and advantages of different types of retaining walls.
9	Develop of an excel sheet for calculation of design of T shaped cantilever retaining wall.
10	Develop of an excel sheet for calculation of design of L shaped cantilever retaining wall.
11	Prepare the chart for concept, types, and advantages of different types of combined footings.
12	Develop of an excel sheet for calculation of design of slab type rectangular combined footing.
13	Prepare the chart for different types of water tanks depending on design and location.
14	Develop of an excel sheet for calculation of design of circular water tank resting on ground.
Term work: A) Term work shall consist of **Any TWO** projects from following- Minimum three full imperial sheets based on above projects to be drawn with the help of any drafting software.	
1	Design of post-tensioned simply supported beams flexure and shear with check for deflection.
2	Design of flat slab.
3	Design of retaining walls (T or L).
4	Design of slab type rectangular combined footing.
5	Design of Circular water tank.
B)	Visit to construction site and prepare report on it.
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	Dr .H. J. Shah, “Reinforced Concrete design, Vol I and II”, Charotar Publishing house.
2	Punmia, Jain and Jain, “Comprehensive Design of R. C. Structures”, Standard Book House.
3	Sinha R.C., “RCC Analysis and Design- Vol. I, II”, Chand and Co, New Delhi.
4	Ramamrutham, “Design of R. C. Structures”, Dhanpat Rai Publications.
5	N. Krishna Raju, “Advanced Reinforced Concrete Design”, CBS Publishers and Distributors.
6	T. Y. Lin and N. H. Burns, “Design of P.S.C structures”, John Wiley and Sons, New York.
7	S. S. Bhavikatti, “Advanced R.C.C. Design”, New Age International Ltd.
8	N. Subramanian, “Design of Reinforced Concrete Structures”, Oxford University Press.
9	S. Unnikrishnan Pillai, and Devidas Menon, “Reinforced Concrete Design”, Tata McGraw Hill

	Publications.
10	N. Krishna Raju, “Prestressed Concrete”, Tata McGraw Hill Publications.
11	Edward Nawy, “Prestressed Concrete: A Fundamental Approach”, PHI.
Codes:	
1	IS 3370: Indian Standard code of practice for concrete structures for storage of liquids, Bureau of Indian Standards, New Delhi.
2	IS 1343: Prestressed Concrete - Code of Practice.
3	IS 456: Indian Standard code of practice for plain and reinforced concrete, Bureau of Indian Standards, New Delhi.
4	IS 13920: Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice (First Revision), Bureau of Indian Standards, New Delhi.
5	SP 16: Design Aids for Reinforced Concrete to IS 456.

COURSE: PROJECT STAGE-I

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical: 02 Hrs / Week	Term work: 50Marks Oral: 50Marks	Practical: 03 Credits
		Total: 03 Credits

Course Pre-requisites: The students should have knowledge of

1	Core Civil Engineering Courses
2	Analytical skills
3	Soft and Computing Skill

Course Objective : On completion of the course -

The student shall be able to identify the problem and suitable solution for the same.

Course Outcomes: On completion of the course, the students will be able to -

1	identify the grey areas of present condition by literature review
2	define the objective of the project and scope of the project
3	decide the methodology to achieve objective of the project
4	estimate resources and cost of project
5	do planning and coordination of project work
6	arrangement for collection of data / resource required.

Course Content:

Unit-I	**Literature Review:** Discuss and identify thrust areas, Conduct Literature review	**(04 Hrs)**
Unit-II	**Define Objective and Scope:** Identify grey areas and decide objective of project work, check feasibility, limitations and define scope of work.	**(04 Hrs)**
Unit-III	**Methodology:** Work out methodology to address grey areas and to achieve objective of project work	**(04 Hrs)**
Unit-IV	**Cost Estimate:** Predict resources required for the work, Evaluate quantity and cost of resources, Estimate overall cost of project	**(04 Hrs)**
Unit-V	**Project Planning:** Prepare weekly plan of project work, distribute responsibilities and coordination	**(04 Hrs)**
Unit-VI	**Resources provision:** Collect data required, arrange resources and material required.	**(04 Hrs)**

Term work: The project work shall consist of any project pertaining to Civil Engineering field or interdisciplinary field. The students should submit and present Project Stage-I Report which includes consists of above topics. (Maximum Five Students per Project Group)

Oral:

The oral examination will be based on above term work and presentation with reference to course content.

COURSE: CIVIL ENGINEERING SOFTWARE – III (Auto Scan and Auto Steel)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical: 02 Hrs / Week	Term work: 25 Marks Oral: 25 Marks	Practical: 01
		Total: 01

Course Pre-requisites: The students should have knowledge of		
1	Civil Engineering Software – I (Autocad)	
2	Construction Design & Drawing	
3	Project Estimation and Valuation	
Course Objective: On completion of the course -		
	The students will be able to use modern tool of Auto scan and Auto steel for estimation of project	
Course Outcomes: On completion of the course, the students will be able to -		
1	use the Auto Cad drawings for estimating the quantities	
2	estimate the quantities with better accuracy and speed	
3	present both measurement sheets and Abstracts / summary reports in a systematic way	
Course Content:		
Unit-I	**Introduction of Software Auto scan** Introduction of software, Applications of the Software In Civil industry, Preparation Of Drawing (Burst Or Explode the block references and schedule formation if required).	**(06 Hrs)**
Unit-II	**Working Process Of Auto scan** Setting up project, Read Room Process- Scan the drawing and get the reports of floor Finishing items like- Tiles, Paints, Plaster, brickwork, No Door Windows, Waterproofing, Staircase etc	**(06 Hrs)**
Unit-III	**Introduction of Software Auto steel** Introduction of software, applications of the software In Civil industry, preparation of drawing (Burst Or Explode the block references and schedule formation if required).	**(06 Hrs)**
Unit-IV	**Working Process Of Auto steel** Setting up project, Working of All type of footing, column, beam, slab. Working of shear wall, retaining wall, staircase etc	**(06 Hrs)**
Term work: The term work shall consist of consists **Any FOUR** out of following –		
1	Assignment on different toolbars and menu bars used in Auto Scan	
2	Assignment on flowchart of steps for working process of Auto Scan	
3	Practice problems on Auto Scan	
4	Assignment on different toolbars and menu bars used in Auto Steel	
5	Assignment on flowchart of steps for working process of Auto Steel	
6	Practice problems on Auto Steel	
Oral:		

	The oral examination will be based on above term work and course content.
Reference Books:	
1	Auto Steel Manual
2	Auto Scan Manual
3	Manual estimation books for subject knowledge

COURSE: INTERNSHIP		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Duration: 60 days	Term work: 25 Marks Oral: 25 Marks	Term work: 03 Credits
		Total: 03 Credits

Course Pre-requisites: The students should have knowledge of	
1	Core Civil Engineering Courses
2	Analytical skills
3	Soft and Computing Skill
Course Objective: On completion of the course -	
	The student shall be able to work effectively on civil engineering project.
Course Outcomes: On completion of the course, the students will be able to -	
1	learn work process, behave responsibly, and follow rules of organization
2	co-relate and apply knowledge of courses learnt on real life project
3	work individually and in team.
4	plan, estimate, communicate and coordinate to complete the work in scheduled time
5	Learn solution to the problems in context of social, environmental, and legal context.
6	use and adopt to modern tools and techniques

Course Content:

Internship: A student has to undergo the inplant training for 8 weeks / 60 days for exposure to industry / site / design office, in one of the Civil Engineering areas. The training may consist of any one or more of the following:

1) Working on any construction site with substantial work related to Civil Engineering
2) Working in any engineering planning / design office with work related to Civil Engineering Design
3) Working in any Civil Engineering industry / Government organisation / research organisation

Term work: Term work consist of an inplant training for 8 weeks / 60 days. Daily work report on above training in logbook duly certified by officer incharge for the training. The report to be submitted within fifteen days from the date of completion of the training.

Oral:

The oral examination will be based on above term work and internship experience.

SEMESTER VIII

COURSE: SEISMIC DESIGN OF STRUCTURES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04Hrs / Week Practical: 02Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks Term work: 25Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of	
1	Design and Detailing of Reinforced Concrete Structures
2	Advanced Design of Structures
3	Limit State Design of Steel Structures
Course Objective: On completion of the course -	
	The students will be able to design the building super structures to resist earthquake forces.
Course Outcomes: On completion of the course, the students will be able to -	
1	apply seismic zones factors for earthquake resistant design.
2	predict nature of vibration of structure.
3	estimate seismic forces on structure using equivalent static method
4	estimate seismic forces on structure using dynamic method
5	design shear wall for seismic forces
6	detailing of reinforcement for ductile performance of structure.

Course Content:

Unit-I	**Earthquake and its Effects:** Causes of Earthquakes, Plate Tectonic, Measurements of Earthquakes, Seismic Zoning, Effects of earthquakes, Earthquakes resistant design philosophy	**(08 Hrs)**
Unit-II	**Theory of Vibrations:** Vibrations - definition, terminologies, (SDOF) - Free, Forced, Damped, Un-damped vibrations with basic examples. Introduction to Multi-degrees of Freedom systems (MDOF), Different types of irregularities in structures.	**(08 Hrs)**
Unit-III	**Determination of Earthquake Forces-Static Method:** Basic definitions, Concept of OMRF &SMRF frames, Seismic coefficient method as per I.S. 1893, Determination of base shear, Lateral force, Storey shear diagram, Application to cantilevers	**(08 Hrs)**
Unit-IV	**Determination of Earthquake Forces- Dynamic Method:** Dynamic Methods, Modes of Vibration, Response Spectra Method as per I.S. 1893,Choice of Method	**(08 Hrs)**
Unit-V	**Design of Shear Wall:** Types and Concept of Shear Wall in earthquake resistance, Design of Shear wall as per 13920	**(08 Hrs)**
Unit-VI	**Ductile Detailing of Earthquake Resistant Design:** General Provisions and rules to be followed for buildings in seismic areas, Ductile detailing of beams, columns, joints and footing for earthquake resistant design as per IS 13920	**(08 Hrs)**

Internal Assessment:

Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare chart / presentation on causes and effect of earthquakes
2	Prepare chart / presentation on various irregularities in buildings.
3	Prepare chart / presentation on different types of vibrations.
4	Prepare model of SDOF and MDOF System
5	Prepare model of Modes shapes
6	Develop an excel sheet on equivalent static method for calculation of EQ forces
7	Develop an excel sheet on dynamic method for calculation of EQ forces
8	Prepare model of Shear wall reinforcement
9	Prepare model showing ductile detailing in beams
10	Prepare model showing ductile detailing in columns
11	Prepare model showing ductile detailing in foundation
12	Prepare model of earthquake resistant building construction

Term work: The term work shall consist of **all THREE** following practical-

1	Design of RC Earthquake resistant building using Equivalent Static Method
2	Design of RC Earthquake resistant building using dynamic Response Spectrum Method
3	Design of Shear wall for earthquake resistant

Reference Books:

1	B.N.Duggal, "Earthquake Resistance Design of Structure", Oxford University Press
2	Pankaj Agarwal, Manish Shrikhande, "Earthquake Resistant Design of Structures" PHI Learning Pvt Ltd
3	Dr. Vinod Hosur "Earthquake Resistant Design of Building Structures"- Wiley India
4	National Information Centre of Earthquake Engineering, "IITK-BMTPC Earthquake Tips", NICEE Publication
5	Anil K Gupta, "Dynamics of Structure", Prentice Hall
6	N.Subramanian, "Design of Steel Structures", Oxford University Press
7	Mario Paz, "Dynamics of structure", CBSPD Publication

Reference Codes:

1	IS1893-"Criteria for Earthquake Resistant Design of Structures", Bureau of Indian Standards.
2	IS13920- "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces" Bureau of Indian Standards

COURSE: HYDRAULIC STRUCTURES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 3 Hours / Week Practical: 2 Hours / Week Tutorial: 1 Hour/Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 3 Practical: 1 Tutorial: 1
		Total: 5

Course Pre-requisites: The students should have knowledge of	
1	Fluid Mechanics
2	Hydrology and Irrigation
Course Objective: On completion of the course	
	The students will be able to design and plan Hydraulic Structures
Course Outcomes: On completion of the course the student will be able to	
1	calculate forces on gravity dam and perform stability analysis.
2	describe method of construction and perform stability of slopes of Earth dam.
3	hydraulic design of Ogee spillway and Energy dissipater.
4	analyze weirs on permeable foundations,
5	design stable channels and Cross drainage works
6	describe river training works and describe components of Hydropower plants

Course Content:

Unit-I	**Reservoir Planning and Gravity Dams:** Investigations for reservoir planning, various storage zones, estimation of reservoir capacity by mass curve method, Gravity dams forces acting and their combinations, criteria for structural stability, modes of failure, elementary profile of gravity dam, construction of gravity dam, Use of colgrout masonry ,foundation treatment.	(06 Hours)
Unit-II	**Earthen dams:** Classification of earth dams, method of construction ,basic design considerations in design of section, phreatic line and its location, stability of slopes ,design of filters ,rock toe and pitching, internal drainage arrangement, cut of trench. Causes of failure of earth dams.	(06 Hours)
Unit-III	**Spillways and Energy Dissipator:** Introduction , function , components, classification ,selection of type of spillway, spillway capacity, hydraulic design of ogee spillway, Energy dissipation below spillway- hydraulic jump type and bucket type, spillway gates.	(06 Hours)
Unit-IV	**Diversion Head Works and canals:** Diversion Head Works Selection of sites, layout of the work types of weirs and barrages, design of subsurface flow, safety against piping and uplift, Bligh, Lane, and Khosala"s Theories, design of weirs on permeable foundations. Canal Irrigation, Types of canal, canal alignment, losses in irrigation channels. Design of lined channels, various types of canal lining, economics of lining.	(06 Hours)

Unit-V	**Stable Channels and Cross Drainage works:** Design of stable channels in alluvium, the regime method, Design of Channel using Lacey's and Kennedy's theory, cross-section of irrigation channels. Canal Masonry Works Cross drainage works, necessity types and selection, comparative merits and demerits, falls, types and design, head regulating works.	(06 Hours)
Unit-VI	**River Training works and Hydropower plants:** Classification of rivers, River training and its objectives, River Training Works- Levees, guide banks, groynes, bank pitching and launching aprons, and their design and construction principles. Hydro Power General features of Hydro-power plant, general layouts of different types, Assessment of power potential, Flow duration curve, main components of Hydro-power schemes, selection of suitable turbine.	(06 Hours)

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Presentation on Case study of the gravity dam in the country with detail report.
2	Presentation on case study of colgroute masonry construction for gravity dam.
3	Presentation on Case study of Roller Compacted concrete dam construction.
4	A report on case studies of failure of earthen dams and their causes.
5	Presentation on construction of a major earthen dam in the country.
6	Prepare a report on location of Spillway for the earthen dams with case studies.
7	Presentation on Case study of the Ogee spillway with detail report.
8	Presentation on Case study of the side channel spillway with detail report.
9	Presentation on Case study of the stable channel in the country with detail report.
10	Prepare a report on channel losses and types of canal linings with case studies.
11	Prepare a report on different types of Cross drainage works with case studies.
12	Prepare a report on Case study of High head Hydropower plant.
13	Prepare a report on case studies of river training works like levees, guide banks.
14	Prepare a report on Case study of Pumped Storage Hydropower plant.
15	Prepare a report on Case study of Run off the river Hydropower plant.

Practical: Any eight of the following

1	Estimation of reservoir capacity using mass inflow curve.
2	Stability analysis of Gravity dam.
3	Stability analysis of an Earth Dam
4	Hydraulic design of a ogee spillway and Energy dissipater.
5	Design of canals.
6	Analysis of a weir on permeable foundation using Khosla's curves.
7	Typical layout of High head hydropower plant.
8	Design of Guide banks.

9	Site visit report on Irrigation project.
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	Asawa G.L., Irrigation and Water Resources Engineering, New Age International (P) Ltd. Publishers, 2006
2	Garg, S. K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers Delhi, 2007.
3	Modi, P.N., Irrigation, Water Resource and Water Power Engineering, Standard Book House, Delhi, 2008.
4	Varshney R. S., Concrete Dams, Oxford and IBH Publishing Co.
5	Bharat Singh and R.S.Varshney Embankment dams , Oxford and IBH ,2000
Codes:	
1	I.S. 6512 Criteria for design of solid gravity dams, first revision, first reprint, September, 1998, B.I.S. New Delhi.
2	I.S. 11223 Guidelines for fixing spillway capacity, edition (1991-09), B.I.S. New Delhi.
3	I.S. 6934 ,Hydraulic design of high ogee overflow spillways – recommendations, first revision, B.I.S. New Delhi.
4	I.S. 10137Guidelines for selection of spillways and energy dissipaters, B.I.S. New Delhi.
5	I.S. 4997 – 1968 (Reaffirmed 1995) Criteria for design of hydraulic jump type stilling basins with horizontal and sloping apron, sixth reprint, January, 1998, B.I.S. New Delhi.
6	I.S. 7365-1985, Criteria for hydraulic design of bucket type energy dissipaters, first revision, B.I.S. New Delhi

COURSE: ELECTIVE –II- ADVANCED STEEL DESIGN		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04Hours / Week	End Semester Examination: 60Marks Internal Assessment:40Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Limit State Design of Steel Structures
2	Mechanics of Solids
3	Analysis of Structures

Course Objective: On completion of the course -

The students will be able to design different types of steel structures using limit state design.

Course Outcomes: On completion of the course, the students will be able to -

1	design the member for different forces
2	design moment resisting connection.
3	design truss bridge
4	design of building Frame
5	design plate girder
6	evaluate design forces on gantry girder.

Course Content:

Unit-I	**Design of Structural Elements:** Design of Members for Axial Tension, Axial Compression, Shear and Bending Moment. Check for deflection	**(08 Hrs)**
Unit-II	**Design of Moment Resisting Connection:** Design of bolted and welded connections for Moment, Design of connection for combined Shear and Moment.	**(08 Hrs)**
Unit-III	**Design Truss Bridge:** Components of truss bridge, Load calculation, Load combinations, Analysis and Design	**(08 Hrs)**
Unit-IV	**Design of Building Frame:** Load Calculation, Analysis of Frame, Design of Beams, Design of Columns, Design of Beam-to-Beam connection, Design of Beam to Column connection.	**(08 Hrs)**
Unit-V	**Design of Welded Plate Girder:** Design of Cross section, Design of connection between web and flange, Design of Load carrying and Load bearing Stiffeners, Design of Intermediate Stiffeners, Design of Horizontal Stiffeners, Design of connection between stiffeners and section.	**(08 Hrs)**
Unit-VI	**Design Philosophy for Gantry Girder:** Components and functioning of gantry girder, Design philosophy for Gantry Girder	**(08 Hrs)**

Internal Assessment:

Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: AnyONE based on following topics but not limited to it	
1	Prepare model of Rigid and Hinge connection
2	Prepare model of Truss Bridge
3	Prepare model of Plate Girder
4	Prepare model of Gantry Girder
5	Prepare model of Building Frame
6	Prepare Presentation on design of Rigid and Hinge connection
7	Prepare Presentation on design of Truss Bridge
8	Prepare Presentation on design of Plate Girder
9	Prepare Presentation on design of Gantry Girder
10	Prepare Presentation on design of Building Frame
Reference Books:	
1	S. K. Duggal, "Limit State Design of Steel Structures", Tata McGraw-Hill Education
2	S.S.Bhavikatti, "Design of Steel Structures: By Limit State Method", I K International Pub
3	M. R. Shiyekar, "Limit State Design in Structural Steel", Prentice-Hall of India
4	N. Subhramanian, "Design of Steel Structures", Oxford University Press
5	Ramchandra, "Limit State Design of Steel Structures", Scientific Publications
Reference Codes:	
1	IS:800-2007, "General Construction in Steel - Code of Practice", Bureau of Indian Standards
2	IS:875-1987, "Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)" Bureau of Indian Standards
3	SP-6(6)- 1972, "Handbook for Structural Engineers" ,Bureau of Indian Standards

COURSE: ELECTIVE – II GEO-SYNTHETICS AND APPLICATION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory:04 Hours / Week	End Semester Examination:60 Marks Internal Assessment: 40 Marks	Theory:04
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Geomechanics
2	Foundation Engineering

Course Objective: On completion of the course -

To make student aware about manufacturing and performance of geo synthetics and its application in Civil Engineering construction project.

Course Outcomes: On completion of the course, the students will be able to -

1	understand use of geosynthetic materials in the field of Civil Engineering construction works.
2	identify the various properties of Geosynthetics.
3	design the geo-synthetics for the various functions in Civil Engineering work.
4	investigate effect of geo-synthetics in design of retaining wall
5	investigate effect of geo-synthetics in design of flexible pavements
6	describe mechanism of soil reinforcement to improve bearing capacity of soil

Course Content:

Unit-I	**Introduction to Geo-synthetics material:** Introduction, Historical Development, necessity of geosynthetics, Classification of Geosynthetics, manufacturing process, Functions, and applications.	**(08 Hrs)**
Unit-II	**Properties of Geosynthetics material:** material used in Geosynthetics, properties of Geosynthetics:- physical, mechanical , hydraulic & endurance, Nano material.	**(08 Hrs)**
Unit-III	**Geotextiles:** Design criteria for Separation, Reinforcement, Stabilization, Filtration, Drainage and Moisture barriers. Geogrids: Designing for Reinforcement, Stabilization, Designing Gabions Construction methods.	**(08 Hrs)**
Unit-IV	**Application of Geo-synthetics in reinforced soil retaining wall :** Types of the facing element, construction procedure, cost, design of geo-synthetics wrap around face wall, geo-grid reinforced soil wall, geo-cell wall and gabion wall.	**(08 Hrs)**
Unit-V	**Application of Geo-synthetics in Pavement**: Mechanism and concept of pavement, design of unpaved road using geo-synthetic material, giroud and Noiray method, airfield pavement design	**(08 Hrs)**
Unit-VI	**Application of Geo-synthetics in ground improvement:** Consolidation technique, prefabricated vertical drain, ground instrumentation and monitoring, design of encased stone column, bearing capacity of geo-synthetics reinforced soil system, mechanism of geo-cell reinforced sand overlaying soft clay.	**(08 Hrs)**

Internal Assessment:		
	Unit Test -1	Unit No: - I, II, III
	Unit Test -2	Unit No: - IV, V, VI

Project Based Learning: AnyONE based on following topics but not limited to it	
1	To prepare chart on Historical development of geosynthetics.
2	Study and prepare a presentation of classification geosynthetics.
3	To prepare a detailed report on properties of geosynthetics.
4	To prepare chart on use of various raw materials for manufacturing of geosynthetics.
5	To prepare a detailed report on design criteria of geotextile for various functions.
6	To prepare a detailed report on use of geosynthetics in soil retaining structures.
7	To prepare chart on giroud and Noiray method.
8	To prepare a detailed report on design of unpaved road using geo-synthetic material.
9	To prepare chart on consolidation technique.
10	To prepare a detailed report on use of geosynthetics in ground improvement.

Reference Books:	
1	G.L. Sivakumar Babu, "An Introduction to Soil Reinforcement and Geosynthetics", Universities Press,India,
2	Robert M. Koerner, "Designing with Geosynthetics" 6th editionXlibris Corporation, 2012
3	Sanjay kumar Shukla and Jijan-Hua Yin, "Fundamentals of Geosynthetics Engineering" CRC Press, 2017, Hyderabad.
4	G.V. Rao & G.V.S.S. Raju, "Engineering With Geosynthetics", Tata McGraw-Hill Publication Co Ltd, 1990.

COURSE: ELECTIVE II – URBAN PLANNING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Building Planning and Design
2	Building Byelaws and Development Control rules
3	Infrastructure Engineering
Course Objective: On completion of the course -	
	The students will understand the concept and study the process of urban planning
Course Outcomes: On completion of the course, the students will be able to -	
1	learn various definitions of planning, various sources of planning knowledge and various forms of planning knowledge.
2	understand importance of Urban and Regional Planning at various levels
3	learn about development plan and development control regulations also various guidelines and various land uses.
4	learn the concept and planning of smart cities
5	conduct the traffic planning surveys
6	learn basics of governance in planning and Global cities and its characters.

Course Content:

Unit-I	**Definitions and Rationales of Planning** Various definitions of town and country planning; Goals and objectives of planning; Components of planning; Benefits of planning	**(08 Hrs)**
Unit-II	**Foundations of Planning** Sustainability and rationality in planning; Components of sustainable urban and regional development; Town & Country Planning at National, Regional and Local levels; The physical planning process; Land-use planning, determinants of land use, Zoning and density control; urban sprawl.	**(08 Hrs)**
Unit-III	**Development Plans and Development Regulations, Zoning Regulations** Definition of development plan; Types of development plans: master plan, city development plan, structure plan, district plan, action area plan, subject plan, town planning scheme, regional plan, sub-regional plan; Planning Advisory Group report and the URDPFI Guidelines; Defining development and development control regulations,	**(08 Hrs)**
Unit-IV	**Smart City Planning** Concept of Smart City; Urban renewal, retrofitting and redevelopment program. Smart city planning for solid waste management, rejuvenation of streams and rivers, affordable housing to poor ,housing and slum redevelopment, energy efficient and green buildings, Water supply and its management, Concept of intelligent transport network and green belts. E governance and citizen’s participation.	**(08 Hrs)**
Unit-V	**Traffic Planning**	**(08 Hrs)**

	Concept of PCU and level of service, capacity of uninterrupted flow conditions, factors affecting; capacity and level of service; capacity of rural and urban roads, capacity at intersections. Traffic Volume Count, origin destination survey, speed and delay study, parking surveys, road network inventory, accident study, need of public transport.	
Unit-VI	**Governance of Planning** Local government in India; District Planning Committees and Metropolitan Planning Committees; Use of remote sensing and GIS in planning; Introduction to Internationalization and globalization of planning	**(08 Hrs)**

Internal Assessment:

Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare the power point presentation on the definitions and components of planning
2	Prepare the poster on the benefits of planning
3	Prepare the model of planning at various levels
4	Prepare the conceptual model of land use zoning
5	Prepare the report on URDPFI guidelines
6	Prepare a poster on Comparative study of various types of plan
7	Prepare the poster on components of smart city
8	Case studies on urban renewal, retrofitting and redevelopment
9	Prepare the model on level of service
10	Prepare the survey format for parking surveys
11	Prepare the survey format for Traffic Volume Count
12	Prepare the survey format for Origin Destination Survey

Reference Books:

1	L.R. Kadiyali, “ Traffic Engineering and Transport Planning” Khanna Publishers, New Delhi, 2007
2	Annapurna Shaw ,” Indian cities “ Oxford India ,2012
3	B. Gallion, S. Eisner , “The Urban Pattern”, Van Nostrand Reinhold Company,2003
4	ITPI, “ City and Metropolitan Planning & Design” ITPI, New Delhi
5	Faludi, A. A Reader in Planning Theory - Pergamon Press, Oxford.
6	Faludi, A. Planning Theory - Pergamon Press, Oxford.
7	Keeble, L. Principles and Practice of Town - The Estate Gazette, London Town and Country Planning
8	McLoughlin, J.B. Urban and Regional Planning:- Faber and Faber, London. A System Approach
9	McLoughlin, J.B. Control and Urban Planning - Faber and Faber, London.
10	Hall, P. Urban and Regional Planning Fourth Routledge, London
11	Freidmann, J. Planning in the Public Domain - Princeton University Press, Princeton.
12	Fainstein, S.S. and Readings in Planning Theory - Mackwell. Campbell, S.
13	Smart City Guidelines, Ministry of Urban Development, Govt. of India. 2015

Reference Codes:	
1	Urban and Regional Development Plans Formulation and Implementation (URDPFI) guidelines by Ministry of Urban Development, Government of India.

COURSE: ELECTIVE II -RURAL SANITATION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Water Supply Engineering
2	wastewater Treatment Methods

Course Objective: On completion of the course

The students will be able to extrapolate the methods of rural water supply, treatment requirements and management of liquid waste.

Course Outcomes: On completion of the course, The student will be able to

1	describe the concept of sanitation
2	elaborate the onsite rural sanitation concept
3	detailed about the management of night soil and liquid waste
4	identify the sources of rural water supply system, problem associated with it
5	decide the methods of treatment required for rural water supply
6	get familiar with govt. policies regarding rural sanitation

Course Content:

Unit-I	**Introduction To Sanitation:** Sanitation, Hygiene, Meaning of WASH, methods of sanitation, general concept and scope of sanitation in rural areas, importance of sanitation. Sanitation problems in rural areas, challenges of rural sanitation. Ecological sanitation.	**(08Hrs)**
Unit-II	**RURAL SANITATION** Introduction to rural sanitation; On site sanitation systems and community latrines, concept of Eco-sanitation, trenching and composting methods, two pit latrines, aqua privy, septic tank, soak pit. Disposal of Solid Wastes; Composting, land filling, incineration, Biogas plants, Rural health. WADEP.	**(08Hrs)**
Unit-III	**SMALL SCALE [RURAL] WATER SUPPLY** Introduction- Magnitude and problems of water supply and sanitation in rural areas in India, Relationship of environmental sanitation and health and its importance, Water and Health, Sources of water and characteristics , Diseases transmitted through water and channels of transmission of infection, Protected water supply ,Community wells - Study of various types of wells, Disinfection for Tank and well.	**(08Hrs)**
Unit-IV	**WATER SUPPLY SCHEMES IN RURAL AREAS** Individual village and group schemes, Source of water supply: Springs, wells, infiltration wells, radial wells, infiltration galleries and surface water intake, Treatment of water for rural water supply, Compact system: multi bottom settler, horizontal roughing filter, slow sand filter, cloth filter, chlorine diffuse cartridges, house-hold water treatment, pumps, pipe,	**(08Hrs)**

	materials, appurtenances & advancement in rural water supply schemes, Distribution system for rural water supply.	
Unit-V	**WATER QUALITY** Water sample collection for water quality test ,National Rural Drinking Water Programme, National Water supply and sanitation programme ,Water Quality Monitoring.	**(08Hrs)**
Unit-VI	**POLICIES AND PROGRAMMES RELATED TO WASH** Governmental Policies and Programmes - Central Rural Sanitation Programme (CRSP) 1986, Total Sanitation Campaign (TSC) Programme 1999, Nirmal Bharat Abhiyan 2012; Swachh Bharat Mission 2014, and Role of Local Bodies. Accelerated Rural Water Supply Programme (ARWSP), the Sector Reforms Project, Swajal Dhara, and the National Rural Drinking Water Programme (NRDWP).	**(08Hrs)**

Internal Assessment:

Unit Test -1	Unit No. I,II,III
Unit Test -2	Unit No. IV,V,VI

Project Based Learning:

1	Prepare the chart showing Sanitation problems in rural areas.
2	Prepare PPT on the overall concept of rural sanitation
3	Prepare the models of water supply system in rural area.
4	Prepare the chart showing the poor sanitation in rural area along with the remedies.
5	Prepare a model on Composting of solid waste; land filling, incineration; Biogas plants etc.
6	Prepare a model on Treatment of water for rural water supply.
7	Visit the rural area to understand the sanitation and give the practical remedies/improvements on the current system. / Visit to “APPA PATWARDHAN SAFAI WA PARYAWARAN TANTRANIKETAN”, DHEHUGAON.
8	Prepare a data required for conduction of Campion/ program in rural area related to sanitation awareness.
9	Prepare a chart showing various govt. schemes, policies & strategies for rural sanitation.
10	Collect the water sample from rural area for testing the concerned water parameters.
11	Prepare a chart showing the effect of used water on the soil.

Reference Books:

1	Rural Sanitation Planning and appraisal W. Armstrong
2	Rural Water Supply and Sanitation South Asia rural development series South Asia rural development series: India water resources management DANIDA.
3	Basic Sanitation In Rural India by Sunder Ram (Ed), Shipra Publications
4	Preventive and Social Medicine by J.E Park and K. Park
5	Municipal and Rural Sanitation by Ehlers and Steel.
6	Public Health Engineering by GS Bajwa.
7	Wastewater engineering, treatment and reuse by Metcalf and Eddy, 5th Edition, Tata Mc Graw Hill

8	Environmental sanitation –Ehlers, V.M., add steel, E. W., Mc Graw-Hill Book Co.
9	Gupta, S., “Rural Water Supply and Sanitation”, VAYU Education of India
10	Wright, F.B., “Rural Water Supply and sanitation”, Kruger Publishing Company
11	Birdie, G.S., and Birdie, J.S., “Water Supply & Sanitary Engineering”, Dhanpat Rai Publishing Co. Pvt Ltd.
12	Husain, S.K., “Textbook of Water Supply and Sanitary Engineering”, Oxford & IBH Publishers
13	CPHEEO Manual.
14.	CPHO Manual

COURSE: ELECTIVE -II ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04Hours / Week	End Semester Examination: 60Marks Internal Assessment: 40Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Basic Engineering sciences
2	Basic geology
3	Engineering Mechanics
Course Objective: On completion of the course -	
	The students will be able to intends to provide sound knowledge in applying the concepts of mechanics in analysing stability problems related to rocks. The course covers topics related to failure theories of rocks.
Course Outcomes: On completion of the course, the students will be able to -	
1	Know the geology, mineralogy & petrology
2	Informed about seismology , geo-hydrology
3	Know the Importance of geological investigation in engineering projects to carry out the site selection of various civil constructions like dam, tunnel etc.
4	Classify rocks and gain an understanding of the strength and stress-strain response of rocks
5	Analyze the effect of water and cracking on engineering property of rocks
6	Design structures in rocks and adjudge stability of rock slopes

Course Content:

Unit-I	**Physical Geology:** Weathering, Erosion, Transportation, Deposition, Geological Agents. Overall ideas about the work done by Geological Agents. The Earth-Origin, age, internal constitution. Mineralogy & Petrology, Importance of geology in civil engineering structures.	**(08Hrs)**
Unit-II	**Mineralogy & Petrology:** **Mineralogy**: Definition of Minerals, Non-crystalline, Crystalline matter and -Crystals. Physical Properties of Minerals in general. An Introduction to physical properties of Common Rock Forming Minerals and Economic Minerals **Petrology**: Definition of Rocks. Brief idea on different types of Rocks. Igneous Rocks-, forms, Structures and Textures. Sedimentary Rocks-Genesis, Texture, Classification. Metamorphic Rocks -Factors controlling Metamorphism, Textures and Structures of Metamorphic Rocks. Petrography of common Igneous, Sedimentary and Metamorphic rocks	**(08Hrs)**
Unit-III	**Structural Geology:** Brief idea about fold, fault, unconformity, lineation, foliation, Seismology: An introduction to Earthquake. Elastic Rebound Theory. Different types of seismic waves. Global distribution of seismic zones, Geohydrology - Sources of Ground water, Hydrological Zones below the surface, porosity,	**(08Hrs)**

	permeability, aquifer-confined and unconfined, engineering importance of ground water study Engineering Geology –Importance of geological investigation in engineering projects, site selection for dam, bridge, tunnel & reservoir, stability of hill slopes along road and railway cuttings	
Unit-IV	**Rock Classification and Coring:** Composition of rocks, engineering, classification of rocks and limitation, rock structures and pore space inrock, rock coring methods.	**(08Hrs)**
Unit-V	**Rock Strength and Failure Theories:** Elastic properties of rock, stress-strain relations, application of elastic theory to rock design, uni-axial and tri-axial strength of rocks, failure theories of rocks and propagation of cracks.	**(08Hrs)**
Unit-VI	**Design Theories and Measurement Methods:** Griffith Crack Theory, water in rock, structural feature of massive rocks and their effects on engineering properties, measurement of stresses in rock mass, various measuring devices, evaluation of properties of rocks in field.	**(08Hrs)**

Internal Assessment:

Unit Test -1	Unit No. I,II,III
Unit Test -2	Unit No. IV,V,VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Collection of different types of rocks.
2	Prepare a chart showing different types of texture, folds & failure in rocks.
3	Structural interpretation & mineral potential using remote sensing data & GIS tool.
4	Determination of rock parameters, specific gravity, density & compressive strength of different types of rock.
5	Geophysical investigation using seismic refraction method to determine causes of real failure.
6	Resistivity methods used in horizontal & vertical discontinuities in electrical properties of the ground water.
7	Application of electrical resistivity methos in ground water exploration.
8	Calculate uniaxial and triaxial strength of rocks samples.
9	Collection of various core samples of the rocks.

Reference Books:

1.	S. P. Bindra S.P.Arora “Building Construction”, Laxmi publications.
2.	Gupta R.B. A textbook of engineering Geology, P.V.G. Publications, Pune.
3.	John Hudson, John Harrison, Engineering Rock Mechanics an Introduction to the Principles1st Edition.
4.	Rock mass classification, by Bhawani singh and R.K. Goel
5.	Engineering rock mechanics: part 1, by john a. Hudson and john p. Harrison
6.	Engineering rock mechanics: part 2, by john a. Hudson and john p. Harrison
7.	Fundamentals of rock mechanics by j. C. Jaeger, n. G. W. Cook, andr. W. Zimmerman
8.	Rock mechanics for underground mining by b. H. G. Brady and e. T. Brown

9.	Introduction to rock mechanics by richard e. Goodman
10.	Understanding earth by Press, Frank, Raymond Siever, John Grotzinger, and Thomas H. Jordan. Macmillan
11.	P. K. Mukherjee, A Textbook of Geology, compiled by and published by World Press
12.	GB Mahapatra, A Textbook of Geology, published by CBS Publishers & Distributors
13.	Holmes' Principles of Physical Geology edited by Peter MacLaren Donald Duff, Donald Duff publishedby Taylor & Francis.
14.	Hudson J.A. and J.P. Harrison, “Engineering Rock Mechanics: An Introduction to the Principles”,Elsevier, Oxford.
15.	Goodman, R.E. “Introduction to Rock Mechanics”, John Wiley & Sons.
16.	Ramamurthy, T. (editor) “Engineering in Rocks for Slopes, Foundation and Tunnels”, Prentice HallIndiaPvt. Ltd.
17.	Related codes and manuals from International Society of Rock Mechanics, ASTM and Bureau of Indian Standards.

COURSE: ELECTIVE – II DESIGN OF FOUNDATION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Statics and Dynamics
2	Geomechanics
3	Fluid Mechanics
4	Foundation Engineering
Course Objective: On completion of the course -	
	To familiarize the students for the design of different type of foundations.
Course Outcomes: On completion of the course, the students will be able to -	
1	identify various types of foundations and its necessities.
2	design of raft foundation.
3	understand concept of Pier and Cassion.
4	design of well foundation.
5	analyse the sheet pile foundation.
6	summarizing the concept of machine foundation.

Course Content:

Unit-I	**Introduction: -** Introduction: Basic concept of foundation design, Function of Foundation, General requirements, causes of foundation failure, types of shallow and deep foundations and their use, performance of various types of foundations during past earthquakes, Various IS codes for design of foundations.	**(08 Hrs)**
Unit-II	**Raft Foundation: -** Introduction, types, floating raft, design of raft foundation- conventional and elastic method, principles of design of buoyancy raft and basement, concept of modulus of sub-grade reactions.	**(08 Hrs)**
Unit-III	**Raft, Pier and Cassion Foundation: -** **Pier and Caisson:** Introduction, design of piers, construction of piers, design of open caissons, construction of open caissons, pneumatic caissons, construction of pneumatic caissons, advantages and disadvantages of pneumatic caissons.	**(08 Hrs)**
Unit-IV	**Well Foundation:** Introduction, depth of well foundation and bearing capacity, forces acting on a well foundation, analysis of well foundation, design of individual components of well, Floating Foundation	**(08 Hrs)**
Unit-V	**Sheet pile:** Introduction, Sheet piles and Braced cuts: Cantilever sheet piles including	**(08 Hrs)**

	anchored sheet piles in cohesion-less and cohesive soils: lateral earth pressure diagram, computation of embedment depth. Design of anchored bulkhead:- Free earth support and fixed earth method.	
Unit-VI	**Machine Foundation: -** Introduction, types of machine foundation, dynamic loads, Dynamic soil testing techniques: block vibration test, shear modulus test, Resonance-column test, Two & three borehole techniques, Vibration isolation, General requirements and design criteria, analysis, and design steps involved in Barkans method.	**(08 Hrs)**

Internal Assessment:

Unit Test -1	Unit No: I, II, III
Unit Test -2	Unit No:IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	To prepare demonstrate models of different types of foundations.
2	To prepare detailed report on performance of various types of foundations during past earthquakes.
3	To prepare chart on computation of design load of shallow foundation.
4	To prepare chart on design steps of raft foundation.
5	To prepare detailed report on construction open and pneumatic caisson.
6	To prepare chart on forces acting on a well foundation.
7	To prepare detailed report construction of well foundation.
8	To prepare chart on cantilever sheet pile in cohesive and non-cohesive soil.
9	To prepare detailed report on types of machine foundation.
10	To prepare detailed report on Dynamic soil testing techniques.

Reference Books:

1	A.K.Arora, “Soil Mechanics and Foundation Engineering”, Standard Publishers.
2	B.C. Punmia, “Soil Mechanics and Foundation Engineering”, Laxmi Publication.
3	Dr. P.N. Modi, “ Soil Mechanics and Foundation Engineering” Rajsons Publications Pvt. Ltd.
4	Murthy V. N. S, “Advanced Foundation Engineering”, C.B.S. Publishers.
5	N.V. Nayak, “Foundation Design Manual”, Dhanpat Rai and Sons.

COURSE: ELECTIVE II – METRO SYSTEMS AND ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Construction Techniques
2	Infrastructure and Transportation Systems
3	Urban Planning
Course Objective: On completion of the course -	
	The students will understand the construction, implementation and operation of Metro Systems.
Course Outcomes: On completion of the course, the students will be able to -	
1	explain the basics of metro systems
2	appreciate the importance of different modes of transportation and characterize the rail transportation
3	discuss construction methods for elevated and underground section
4	explain the construction quality and safety
5	apply electronic signaling systems and automatic fare collection
6	understand the importance of railway infrastructure planning and design at global level

Course Content:

Unit-I	**General** Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials, Origin of railways and metro, Introduction to Transit Oriented Development	**(08 Hrs)**
Unit-II	**Basics of Metro development in India and at global level** Development of metro in Indian metropolitan cities Rail transit development in foreign countries Various organizations working for the development of metro rail transit system and vision of the governing bodies behind the development	**(08 Hrs)**
Unit-III	**Construction Methods** Civil Engineering- Overview and construction methods for elevated and underground stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations	**(08 Hrs)**
Unit-IV	**Quality & Safety Systems** Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management	**(08 Hrs)**
Unit-V	**Operation Control Centre** Electronics and Communication Engineering- Signalling systems; Automatic fare collection; Intelligent Transport System; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.	**(08 Hrs)**

Unit-VI	**Technology enhancement for Metro construction at global level** Case studies for the development done in metros, rail transit operation (Light rail transit, Metro, Mono rail, urban rails) at global and Indian level Similar technology development (alternatives)-TRAM, Sky bus, Electric Bus, Subways etc.	**(08 Hrs)**

Internal Assessment:

Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare a poster on ‘Advantages of Metro Systems’.
2	Study the detailed Project Report of Metro and prepare a power point presentation.
3	Prepare the power point presentation on ‘Need of Metro Systems in India’.
4	Prepare a poster on various organizations working on Metro Rail Transit Systems.
5	Prepare a model for underground metro station.
6	Prepare a model for elevated metro station.
7	Prepare a power point presentation on Initial Surveys and Investigations for Metro Systems.
8	Prepare a poster on Metro Safety Systems.
9	Prepare a model for multi modal transfers at Metro Station.
10	Prepare a model on Signaling System of Metro
11	Prepare a power point presentation on Automatic fare collection system.
12	Case study of Metro System and prepare a report based on it.

Reference Books:

1	Satish Chandra and M.M. Agrawal, Railway Engineering, Oxford University Press, New Delhi
2	S.C. Saxena and S. P. Arora, A Text Book of Railway Engineering, Dhanpat Rai & Sons, New Delhi
3	S.C. Rangwala, K.S. Rangwala and P.S. Rangwala, Principles of Railway Engineering, Charotar Publishing House, Anand
4	General & Technical information of Hyderabad Metro
5	General & Technical information of Delhi Metro
6	Metro Rail Projects in India: A Study in Project Planning Book by M. Ramachandran
7	Urban rail transit construction technology demonstration project: Guangzhou Metro Line Paperback – January 1, 2000 by Lu Guang Lin. Chen Shao Zhang (Author)
8	The Metro Railway Corporation and Maintenance ACT 2002 PART A – Act Indian Railway Board Act, 1905
9	Paul Garbutt, World Metro Systems, Capital Transport Pub; 2nd Edition, 1997.

Reference Codes:

1	IS1893-“Criteria for Earthquake Resistant Design of Structures”, Bureau of Indian Standards.
2	IS13920- “Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces” Bureau of Indian Standards

COURSE:ELECTIVE-II BRIDGE ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Analysis of Determinate and Indeterminate Structures
2	Design of Steel Structures
3	Design of RCC Structures
4	Analysis and Design of Prestressed Concrete
5	Transportation and Geotechnical Engineering

Course Objective: On completion of the course -

	The students should be able to select and design appropriate bridge structures for given site conditions.

Course Outcomes: On completion of the course, the students will be able to -

1	classify different types of bridges
2	calculate the stresses on bridges as per IRC
3	differentiate different types of bridges
4	design of RC slab bridge deck for highways
5	design the components of railway plate girder bridge
6	design the bridge bearings

Course Content:

Unit-I	**Introduction to Bridge Engineering:** Classification of bridges, Components of Bridges, Preliminary data to be collected during investigation of site for bridges, Economical span, Afflux, HFL, Scour depth and Clearance, Locations of piers and abutments, Factors influencing the choice of bridge super structure, Approach roads.	**(08 Hrs)**
Unit-II	**Superstructure and Substructure:** Components of Superstructure, loads on bridges: Brief specifications of different loads, Forces and stresses coming on bridges as per IRC, Substructure: Abutment, Piers, and Wing walls with their types.	**(08 Hrs)**
Unit-III	**Types of Bridges:** Culvert: Definition, Location, Waterway of culvert and types. Temporary bridges: Definition, Materials used, Brief general ideas about timber, Floating- pontoon bridges. Movable bridges: Bascule, Cut boat, Flying, Swing, Lift, Transporter and Transverse bridges, their requirement and suitability. Fixed span bridges: Simple, Continuous, Cantilever, Arch, Suspension, bowstring girder type and Rigid frame and Cable stayed bridges, Materials for super structure.	**(08 Hrs)**
Unit-IV	**Design of RC Slab Bridge Deck for Highways:** Analysis of slab decks considering cases solid slab spanning in one direction, solid slabs in spanning two direction and solid cantilever slab,	**(08 Hrs)**

	design. Aids and Tables of RC deck bridge slab as per Pigeaud's method, design of slab culvert, Design of RC slabs supported on all sides for T-beam and slab deck.	
Unit-V	**Plate Girder Bridges:** Railroad bridge philosophy, Railroad bridge types, Elements of plate girder and their design such as web, flange, vertical stiffeners, end bearing stiffeners, intermediate stiffeners, and lateral bracing for plate girders.	**(08 Hrs)**
Unit-VI	**Bridge Bearings:** General features and function of bearings, Types of bearings, Design of steel rocker and roller bearings, Design of elastomeric pad bearing, Concept of fatigue.	**(08 Hrs)**

Internal Assessment:

Unit Test -1	Unit: I, II, III
Unit Test -2	Unit: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Prepare the chart for different classification of bridges
2	Prepare the chart for different components of bridges
3	Prepare the chart for site investigations of bridges
4	Prepare the chart for different components of substructure of bridges
5	Prepare the chart for different components of superstructure of bridges
6	Prepare the chart for different types of bridges
7	Develop of an excel sheet for calculation of design of a slab deck spanning in one direction
8	Develop of an excel sheet for calculation of design of a slab deck spanning in two directions
9	Develop of an excel sheet for calculation of design of a solid cantilever slab
10	Develop of an excel sheet for calculation of design of a RC slabs supported on all sides for T-beam.
11	Prepare the chart for different types of railway bridges
12	Prepare the chart for different components of railway bridges
13	Prepare the chart for general features, function, and types of bearings
14	Develop of an excel sheet for calculation of design of a steel rocker and roller bearings
15	Develop of an excel sheet for calculation of design of an elastomeric pad bearing

Reference Books:

1	B. L. Gupta and Amit Gupta, "Highway and Bridge Engineering", Standard publishers Distributors.
2	Rangwala, "Bridge Engineering", Charotar Publication.
3	N. Krishna Raju, "Design of Bridges", Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.
4	D. Johnson and Victor, "Essentials of Bridge Engineering", Oxford and IBH publishing Co. Pvt. Ltd., New Delhi.
5	Wai-Fah Chen and Lian Duan, "Bridge Engineering Handbook", CRC Press Pvt. Ltd.
6	Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi.
7	Ramachandra, "Design of Steel Structures", Standard Publications, New-Delhi.

8	Jain and Jaikrishna, “Plain and Reinforced Concrete”, Vol.2., NemChand Brothers, New Delhi
Codes:	
1	Standard specifications and code of practice for road bridges, IRC section I, II, III, V, VI, VII, and IX.
2	IS 456: Code of practice for Plain and Reinforced Concrete, BIS, Bureau of Indian Standards, New Delhi
3	Indian Railway Standard Code of practice for the design of steel and wrought iron bridges carrying rail, Govt of India, Ministry of Railways.
4	American Association of State Highway and Transportation Officials (AASHTO).
5	Ministry of Road Transport and Highways, India.

COURSE: ELECTIVE-II SOLID WASTE MANAGEMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60Marks Internal Assessment:40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1.	Basic Knowledge of Physics, Chemistry and Mathematics
2.	Basic Knowledge of Environmental Science
3.	Basic Knowledge of Statistics and Computers
Course Objective:	
	To learn the mode of Solid Waste Generation and understand its need and importance to Reuse, Recycle, Refuse and thereby, effectively manage the problem of Solid Waste generated as well as mitigation and combating the issue of land pollution
Course Outcomes: The student will be able to	
1.	Understand the generation, sources and characteristics of Solid Waste
2.	Learn Segregation, Collection and Transportation of Municipal Solid Waste(MSW)
3.	Describe the different steps of executing the relevant methods of solid waste disposal
4.	Implement the relevant methods for disposal of Bio-medical waste
5.	Familiarize with latest Emerging Processing Technologies for Solid Waste for Treatment and Recovery of useful Products
6.	Implement the relevant laws related to solid waste management

Course Content:

Unit-I	**Solid Waste Management**	**(8Hours)**
	Definition of solid waste, Meaning of different solid wastes, Domestic waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, **Sources of solid waste and classification** of solid waste, Physical and chemical characteristics of municipal solid waste. Impact of solid waste on environment, Solid waste management techniques, Factors affecting solid waste generation.	
Unit-II	**Segregation, Storage, Collection and Transportation of MSW Waste**	**(8Hours)**
	Segregation: at source, household level, at transfer station/central sorting facility, Reuse, Recovery and Recycling of solid waste. **Storage:** container categories, Communal containers, Location of Communal Container, Storage of recyclable waste, **Transfer station:** Selection of location, operation and maintenance; options under Indian conditions – Field problems- solving. **Collection:** methods, Tools and Equipments **Transportation**: Transportation vehicles with their capacity.	
Unit-III	**Disposal of Solid Waste**	**(8Hours)**
	Methods of disposal, **Composting:** Principles, factor affecting Composting process, Methods	

	of Composting, Land filling: techniques, factors considered in site selection, methods, Incineration of solid waste	
Unit-IV	**Biomedical Waste and Health Aspects**	**(8 Hours)**
	Definition, Sources and Generation, Classification and Management technologies, Health problems during segregation, recovery , recycling and reuse, public involvement in Biomedical Waste management.	
Unit-V	**Solid Waste Processing Technologies**	**(8 Hours)**
	Introduction, Vermi-composting, Bio-methanation, Pyrolysis, Plasma Arc Technology/Plasma Pyrolysis Vitrification, Refuse Derived Fuel, Hydro pulping, Slurry Carb Process, Treatment For Recovery Of Useful Products, E waste management, Integrated solid waste management	
Unit-VI	**Legal Aspects of Solid waste Management**	**(8 Hours)**
	Legal Aspects- present scenario Muncipal Solid Waste Management Rules-2016, E-Waste Management Rules,2016, Construction and demolition Waste Management Rules 2016, Plastic Waste Management Rules 2016, Role of Central Pollution Control Board and Maharashtra Pollution Control Board in management of solid waste.	

Internal Assessment:

Unit Test -1	I,II,III
Unit Test -2	IV,V,VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	Write a report on Segregation and Storage of Waste at your home
2	Visit nearby slums and write report on Provision of SWM Services in slums
3	Clean My institute
4	Zero Waste Initiative
5	Waste Management Program for institute
6	Model of land fill
7	Visit nearby Transfer station and write report
8	Audit of E-waste of institute
9	Case study on Industrial Solid Waste Management
10	Power Point Presentation on Industrial Solid Waste Management
11	Selection of solid waste management site through Arc Gis

Reference Books:

1	Handbook of Solid Waste Management, George Tchobanoglous and Frank Kreith, Second Edition, McGRAW-HILL
2	Solid Waste Management, K. Sasikumar, Sanoop Gopi Krishna, PHI Learning, 2009
3	Solid Waste: Engineering Principles and Management Issues, , George Tchobanoglous, 1stEdition, Mc GRAW-HILL
4	Solid Waste Technology and Management Vol. 1 and 2, Thomas Christensen, Wiley Publishing, 2010

5	Solid Waste Management, Stefen Burnley, Wiley Publishing, 2014
6	Assessment of the Status of Municipal Solid Waste Management in Metro Cities, State Capitals, Class I Cities and Class II Towns in India: An Insight .Sunil Kumar, J.K. Bhattacharya, A.N. Vaidya, Tapan Chakrabarti, Sukumar Devotta, A.B. Akolkar. Kolkatta : Central Pollution Control Board (CPCB), National Environmental Engineering Research Institute (NEERI), 2008.
7	Ministry of New and Renewable Energy, MNRE. National Master Plan for Development of Waste-to-Energy in India. Ministry of Environment and Forests. [Online] 2003.
8	Census of India, 2011. Census of India. [Online] 2011
9	National Environmental Engineering Research Institute, NEERI. Air Quality Assessment, Emissions Inventory and Source Apportionment Studies: Mumbai. New Delhi : Central Pollution Control Board (CPCB), 2010
10	Department of Economic Affairs, Ministry of Finance, Government of India. Position Paper on the Solid Waste Management Sector in India. Public Private Partnerships in India. [Online] November 2009.
11	Ministry of Urban Development, Government of India. Guidance Note: Municipal Solid Waste Management on a Regional Basis. Ministry of Urban Development, Government of India. [Online].
Codes:	
1	IS 12647: Solid Waste Management Systems--Collection Equipment--Guidelines Bureau of Indian Standards (BIS)
2	CPHEEO MANUAL

COURSE: ELECTIVE – II ADVANCE GEOTECHNICAL ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination:60 Marks Internal Assessment: 40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Statics and Dynamics
2	Geomechanics
3	Fluid Mechanics

Course Objective: On completion of the course -

To acquire knowledge of various parameter related to Engineering behaviour of soils and the suitability of soils for different civil Engineering Projects.

Course Outcomes: On completion of the course, the students will be able to:

1	describe role of water in soil behavior and concept of flow net.
2	apply knowledge of consolidation to foundation design.
3	estimate the stress under any type of loading conditions.
4	demonstrate concept, principle and working of various geotechnical instruments.
5	analyse the stability of earth slopes using various methods.
6	understand dynamic soil properties.

Course Content:

Unit-I	**Stress distribution in soil: -** Introduction, state of stress at a point, equilibrium equation, pressure distribution on horizontal and vertical planes, stresses due to point load, line load, strip load, uniformly loaded circular and rectangular areas. use of Newmark's chart.	**(08 Hrs)**
Unit-II	**Seepage Analysis: -** Soil moisture and mode of occurrence, permeability, Darcy's law, field determination of coefficient of permeability: Pumping out tests, Pumping in test, flow net for one dimensional flow and two-dimensional flow, seepage through non-homogenous and anisotropic soil, methods of obtaining flow net, radial flow net.	**(08 Hrs)**
Unit-III	**Consolidation: -** Introduction, mechanism of consolidation, basic terms used in consolidation, three-dimensional consolidation equation, sand drain and other techniques to accelerate consolidation process, (Numerical on consolidation)	**(08 Hrs)**
Unit-IV	**Geotechnical Instrumentation: -** Introduction, definition of terms relating to instrumentation characteristics, measurement of pore pressure:- introduction and instrument types, measurement of deformation:- introduction and instrument types	**(08 Hrs)**
Unit-V	**Stability of Earth slopes: -** Introduction, infinite slopes in cohesionless and cohesion soil, stability analysis of finite slopes, planar surface failure:- Culmann's method, Swedish slip circle method, Taylor stability number.	**(08 Hrs)**

Unit-VI	**Introduction of Geotechnical Earthquake Engineering: -** Introduction, causes of earthquake, seismograph, nature and types of dynamic loading, concept of dynamic loading, characteristics of ground motion, effect of local site conditions on ground motions, dynamic soil properties, liquefaction and related phenomena, soil improvement for remediation of seismic hazards.	**(08 Hrs)**

Internal Assessment:

Unit Test -1	Unit No: I, II, III
Unit Test -2	Unit No: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it

1	To prepare demonstrate model of Darcy's law.
2	To prepare chart on flow net and its practical applications in Geotechnical Engineering.
3	To prepare detailed report on different techniques to accelerate consolidation process.
4	To prepare chart on mechanism of consolidation process with proper sketches.
5	To prepare PPT on stress calculation for different types of loading on soil.
6	To Prepare detailed report on Newmark chart and Westergaard's equation with suitable numerical problem.
7	To prepare detailed report on uses of different geotechnical instruments for measurement of pore pressure and deformation.
8	To Prepare chart on Culmann's method.
9	To prepare chart on Swedish slip circle method.
10	To Prepare PPT on liquefaction phenomena with case study.
11	To prepare detailed report of a case study on earthquake hazards.
12	To prepare detailed report on types of embankment failure due to earthquake.

Reference Books:

1	A.K.Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers.
2	B.C. Punmia, "Soil Mechanics and Foundation Engineering", Laxmi Publication.
3	Dr. P.N. Modi, " Soil Mechanics and Foundation Engineering" Rajsons Publications Pvt. Ltd.
4	N.V. Nayak, "Foundation Design Manual", Dhanpat Rai and Sons
5	Braja M. Das, "Fundamentals of Geotechnical Engineering"

COURSE: ITC-VI:CONSTRUCTION QUALITY CONTROL AND SAFETY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03Hours / Week Practical: 02Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40Marks Term work: 25Marks Oral: 25 Marks	Theory: 03 Credits Practical: 01 Credits
		Total: 04 Credits

Course Pre-requisites: The students should have knowledge of	
1	Building Construction
2	Planning and Management of Construction Project
3	Arbitration and Laws related to Construction Industry.
Course Objective:	
	To give exposure and insight on needs of Construction quality control parameters and to make student understand application of safety norm in construction and professional practice.
Course Outcomes: The student will be able to	
1	interpret various quality management systems.
2	identify various system requirements and documentation for TQM.
3	apply quality standards/codes in design and construction.
4	comprehend the factors related to construction safety management.
5	knowledge about safety awareness programs.
6	implement safety guidelines on construction sites.

Course Content:

Unit-I	**Construction Quality Management**: Overview of construction quality control and safety, Quality control and safety standards and regulations, Quality Assurance, Quality assurance plan, Inspection and Testing- Process, Inspection test report, concepts of quality policy, Quality standards, Quality manual.	**(6 Hours)**
Unit-II	**Total Quality Management**: Need for TQM in construction industry,Types of inspections and testing , Features and Elements of TQM, Critical factors of TQM, TQM in construction Projects Quality Certification for companies and laboratories (ISO Certification, NABL certification), Quality control records and documentation, Quality aspects in every phase in the life cycle of Construction project.	**(6 Hours)**
Unit-III	**Quality Management Systems in Construction:** Introduction to quality management systems (QMS), Quality standards/codes in design and construction; (ISO: 9000), Benchmarking, Types of Benchmarking and process, Third Party Certification- Process involved. Six sigma as an effective tool in TQM.	**(6 Hours)**
Unit-IV	**Construction Safety Management**: Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. Role of safety officers, responsibilities of general employees, safety committee, safety training, Incentives, and	**(6 Hours)**

	monitoring. Writing safety manuals, preparing safety checklists and inspection reports.	
Unit-V	**Safety Awareness:** Various safety equipment and gear used on site, Details of PPE's used on sites, First aid on site, Safety awareness program. Labour laws, legal requirement, and cost aspects of accidents on site, Incentive for safety practices.	**(6 Hours)**
Unit-VI	**Safety in Construction Operations**: Safety against accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. Safety at various stages of construction. Prevention of accidents. Safety measures. Safety in handling construction equipment's e.g., vehicles, cranes, hoists, and lifts etc. Safety of scaffolding and working platforms. Safety while using electrical appliances and explosives, Quality control and safety inspection procedures.	**(6 Hours)**

Internal Assessment:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning:

1	Prepare a report on necessity and use of Quality Control and Quality Assurance for different construction projects.
2	Prepare a detailed report on Quality standards for different construction projects.
3	Prepare a detailed report on Quality manual for different construction projects.
4	Prepare chart for different types of Total Quality Management
5	Prepare a detailed report on need for TQM in construction industry
6	Collection of TQM in construction Projects Quality Certification for companies and laboratories (ISO Certification, NABL certification)
7	Collection of various documents required for the certification of ISO and NABL.
8	Collection of various Quality standards in design and construction.
9	Collection of various IS Codes in design and construction.
10	Prepare a detailed report on construction Safety Management – Role of various parties, duties and responsibilities of top management
11	Writing safety manuals on construction safety management.
12	Preparing safety checklists and inspection reports
13	Prepare a detailed report and PPT on safety of accidents on various construction sites
14	Prepare a detailed report and PPT on various safety equipment and gear used on site
15	Mini project on any topic of choice from above modules.
16	Site Visit to existing site.

Term work: (any 8 of the following)

1	Report on construction quality management need for and importance of construction field.
2	Report on construction quality inspection and testing process of material.
3	Report on need for TQM in construction industry

4	Collect construction Projects Quality Certification for companies and laboratories (ISO Certification, NABL certification)
5	Report on detail information on ISO Certification and NABL certification
6	Report on quality standards/codes in design and construction; (ISO:9000),
7	Report on role of various parties, duties, and responsibilities of safety management.
8	Report on prevention of accidents on construction site
9	Report on various safety equipment and PPE kit used on site
10	Report on labour laws, legal requirement, and cost aspects of accidents on site
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Abdul Razzak Rumane, "Quality Management in Construction Projects", Systems Innovation Book Series
2	Kumar Neeraj Jha/ Dilip A Patel/ Amarjit Singh"Construction Safety Management".
Reference Books:	
1	Tim Howarth and David Greenwood. "Construction".
2	James J. O'Brien. "Construction Inspection Handbook: Total Quality Management"
3	S.L. Tang, Syed M. Ahmed, Raymond T. Aoieong "Construction Quality Management", 2005
4	Construction safety manual published by National Safety Commission of India.
5	Construction Safety Publisher: Atbs Publisher
Codes:	
1	IS: 10386 (Part 1) – 1983- Indian Standard Safety code for -construction, operation, and maintenance of river valley projects
2	National Building code of India 2016 Volume 1 (Guidelines)
3	National Building code of India 2016 Volume 1 (Guidelines)

<table>
<tr><th colspan="4">COURSE: PROJECT STAGE- II</th></tr>
<tr><td colspan="2">TEACHING SCHEME:</td><td>EXAMINATION SCHEME:</td><td>CREDITS:</td></tr>
<tr><td colspan="2">Practical: 04Hrs / Week</td><td>Term work: 100Marks
Oral: 100Marks</td><td>Practical: 06 Credits</td></tr>
<tr><td colspan="2"></td><td></td><td>Total: 06 Credits</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">Course Pre-requisites: The students should have knowledge of</td></tr>
<tr><td>1</td><td colspan="3">Project Stage - I</td></tr>
<tr><td>2</td><td colspan="3">Core Civil Engineering Courses</td></tr>
<tr><td>3</td><td colspan="3">Analytical skills</td></tr>
<tr><td>4</td><td colspan="3">Soft and Computing Skill</td></tr>
<tr><td colspan="4">Course Objective: On completion of the course -</td></tr>
<tr><td></td><td colspan="3">The student shall be able to work out suitable solution for the problem.</td></tr>
<tr><td colspan="4">Course Outcomes: On completion of the course, the students will be able to -</td></tr>
<tr><td>1</td><td colspan="3">plan, communicate, coordinate, and exhibit responsibility to complete work in time.</td></tr>
<tr><td>2</td><td colspan="3">execute the process / experiment based on methodology</td></tr>
<tr><td>3</td><td colspan="3">observe and analyse the output / results and validate it.</td></tr>
<tr><td>4</td><td colspan="3">interpret the results and derive the conclusions</td></tr>
<tr><td>5</td><td colspan="3">evaluate and optimise the solution in social, environmental context.</td></tr>
<tr><td>6</td><td colspan="3">prepare report and present the work</td></tr>
<tr><td colspan="4">Course Content:</td></tr>
<tr><td>Unit-I</td><td colspan="2">Project Coordination:
Plan the project experimentation / execution process, distribute responsibility, coordinate the communicate for completion oof work in time.</td><td>(08 Hrs)</td></tr>
<tr><td>Unit-II</td><td colspan="2">Experimentation:
Execute the methodology by doing experimentation / design / process.</td><td>(08 Hrs)</td></tr>
<tr><td>Unit-III</td><td colspan="2">Result Validation:
Observe and tabulate the results systematically and validate the results with sample analytical calculation.</td><td>(08 Hrs)</td></tr>
<tr><td>Unit-IV</td><td colspan="2">Result Analysis and Conclusion:
Interpret the results by plotting graphs, charts and derive conclusion based on it.</td><td>(08 Hrs)</td></tr>
<tr><td>Unit-V</td><td colspan="2">Optimal solution:
Try to optimise the results with due consideration for cost effectiveness, environment sustainability and social aspect. Define scope for further improvement.</td><td>(08 Hrs)</td></tr>
<tr><td>Unit-VI</td><td colspan="2">Project Report:
Collect data required, arrange resources and material required.</td><td>(08 Hrs)</td></tr>
<tr><td colspan="4">Term work:The project stage – II consists of continuation of Project stage -I with addition to above topics and prepare Hard Bound copy of Project Report based on consolidated work of Stage – I and Stage- II (Maximum Five Students per Project Group)</td></tr>
<tr><td colspan="4">Oral:</td></tr>
<tr><td></td><td colspan="3">The oral examination will be based on above term work and presentation with reference to course content.</td></tr>
</table>

COURSE: CIVIL ENGINEERING SOFTWARE – IV (ETABS)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical: 02 Hrs / Week	Term work: 25 Marks	Practical: 01
		Total: 01

Course Pre-requisites: The students should have knowledge of	
1	Design and Detailing of Reinforced Concrete Structures
2	Analysis of Indeterminate Structures
3	Analysis of determinate Structures
Course Objective: On completion of the course -	
	The students will be able to design the structures using ETABS Software
Course Outcomes: On completion of the course, the students will be able to -	
1	generate structural model using ETABS
2	apply Loads and analyze the structure for different Load combinations using ETABS
3	design the structure using ETABS and interpret the results

Course Content:

Unit-I	**Structure Modelling in ETABS:** Introduction to ETABS, GUI interface, Settings, Layout of Toolbars and Menu bars, Generation of skeletal model, Assigning material properties, Support conditions, Constraints and restraints at joints.	**(08 Hrs)**
Unit-II	**Generate Load, Load Combination and Analysis:** Create primary loads, application of loads, Generate Load combinations, Analysis of structure, Checking for equilibrium, interpretation of output of the analysis.	**(08 Hrs)**
Unit-III	**RC Design and interpretation of output:** Generate RC Design parameters, Design of structure and interpretation of output of the structural design.	**(08 Hrs)**

Term work: The term work shall consist of consists **Any FOUR** out of following –

1	Assignment on different toolbars and menu bars used in ETABS
2	Assignment on flowchart of steps for design of structure using ETABS
3	Modelling of structure using ETABS including support, constraints, and releases at joints.
4	Analysis and Design of Plane Frame using ETABS and validation of results
5	Analysis and Design of Space Frame using ETABS.
6	Analysis and Design of Truss using ETABS.

Reference Books:

1	Computers and Structures Inc, “ETABS Training manuals”, CSI Knowledge Base
2	Azuko, “ETABS Handbook”, Azuko Technical Institute
3	Gaurav Verma, “ETABS”, Cadcamcae Works

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Engineering & Technology
B. Tech. - Civil
Old Syllabus

College Information

Bharati Vidyapeeth University college of Engineering, Pune continued to take new strides towards evolving directions to further the growth and dissemination of scientific and technological knowledge.

The college established in 1983, is one of the oldest and largest Engineering Colleges in the state of Maharashtra. The college has well defined goals which are intensely practised and followed.

Their implementation encompass multi-faceted activities in the form of recruiting experienced faculty, organizing faculty development program, Identifying socio-economically relevant areas and emerging technologies. Constant review and upgradation of curricula, Upgradation of Laboratories, library and communication facilities, Collaboration with industries and research and development organizations, Sharing of knowledge, infrastructure and resources, training extension, testing and consultancy services and Promoting Interdisciplinary research.

The college has been ranked as 'A' grade Engineering college by the Government of Maharashtra. Meeting quality standards in education such as is been a motto of this institute. As a pedagogical effect, out of ten under graduate programmes being conducted, seven programmes eligible for accreditation are accredited by National Board of Accreditation(NBA).

The DATAQUEST - CMR conducts an annual survey of technical schools of India and publishes the list of best 100 technical schools in India. In the surveys, for the past seven years, the college has been consistently ranked among top 50 technical schools.

Another feather in Institute's cap is its selection for the grant of Rs. 4.0 Crore under Technical Education Quality Improvement Programme - II(TEQIP-II) by Ministry of Human Resource Development (MHRD) of Government of India supported by World Bank.

This Institute has been ranked to 45th position at all India level and 5th at the Western Region of AICTE in 2012.The Institute has been very sensitive to the human resource development and continues initiating new academic programmes. Presently it offers 09 undergraduate programmes in the field of Civil Engineering, Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Electronics and Telecommunication Engineering, Mechanical Engineering and Production Engineering.

The college offers 08 postgraduate programmes in the field of Civil Engineering,Chemical Engineering, Computer Engineering, Information Technology, Electrical Engineering, Electronics Engineering, Mechanical Engineering and NanoTechnology.

Salient Features

The Department of Civil Engineering offers undergraduate, postgraduate and doctorate degree courses. The department possesses qualified faculty, state-of-the-art infrastructure and its own library. As a part of the infrastructure, the department laboratories are equipped and are capable of conducting research projects and provide consultancy to the industry. The well-equipped hi-tech computer lab provides students with a hands-on experience of the industry relevant softwares that are part of their curriculum. The curiculum is kept up-to-date and relevant by involving industry experts in the revision process. The department has a very active student association which is managed by the students. This association organizes events, expert lectures, site visits and personality development programs every year. The association also publishes a newsletter and maintains its own website. All students complete a six week internship before their final year. For their internship they are sent to various companies across India for on-the-job training in various technical roles.

The Department of Civil Engineering is honing the potential of the students to face the challenges in this vast field. The department also runs a postgraduate course in Hydraulic Engineering, for which it recieves the guidance from internationally recognized scientists in the field of Hydraulics. The P.G. Students perform their dissertation works in collaboration with CW & PRS Laboratories, Government of India- especially the model studies.

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams, and buildings. Civil engineering is the oldest engineering discipline after military engineering. Due to extensive growth in the construction, infrastructure and real estate sectors in India, the demand of civil engineers is high. Career opportunities for these professionals are available with firms of both the private and public sectors. Besides this, job opportunities are obtainable for them abroad too. Civil Engineers can pursue a very lucrative career.

Major Topics of Research Undertaken:

- Studies in the areas of sediment transport and fluid mechanics related to non uniform sediments, hydraulic design of spillways and design of permeable spurs.
- Structural Engineering: Studies of earthquake resistant structures and composite materials.
- Geotechnical Engineering: Utilization of waste plastics in road sub base.
- Environmental Engineering: Use of Moringa Olifera as a coagulant for treatment of potable water.

Research Facilities Developed

- Modernization of Environment Engineering laboratory to carry out research related to water quality management and air pollution control. For this purpose AICTE has provided grant of Rs. 6,00,000/- under MODROBS scheme.
- In Hydraulics Engineering Laboratory, tilting flume and wind tunnel facilities are established.

Consultancy

Testing and Consultancy in the areas of geotechnical Engineering, Structural Engineering and Environmental Engineering is carried out. Total revenue generated in last five years is Rs. 16 lacs.

Total Research Grants Recieved from Academic Year 2004-05 to 2014-15: Rs 7.35 lacs

Research Publications from Academic Year 2010-11 to 2014-15:

Type of Publication	No of Publication
International Journal	43
National Journal	03
International Conference	07
National Conference	04
Total	57

Mission

Create high quality Civil Engineers to meet global challenges.

Vision

"Transformation in Construction Industry for National development."

Program Educational Objectives

PEO 1 To prepare students for career in civil engineering profession.

PEO2 To develop a responsible 'Entrepreneur'.

PEO3 To develop the student to cope up with the advancements in Civil Engineering.

Programme Outcomes

The Graduate Engineers will have the ability to

1. Apply possessed knowledge of fundamental subjects to Civil Engineering problems.
2. Analyze Civil Engineering problems.
3. Design Civil Engineering structures with appropriate consideration to safety, economy, health and environmental considerations.
4. Solve complex Civil Engineering problems by conducting investigations.
5. Use modern Civil Engineering tools, techniques and softwares.
6. Apply their professional responsibilities
7. Understand the impact of professional engineering solutions in societal and environmental contexts.
8. Exhibit professional ethics and norms of engineering practice.
9. Function individually and in teamwork.
10. Communicate effectively in both verbal and written forms.
11. Manage the work and finance of a civil engineering projects.
12. Practice the use of lifelong learning.

Program Educational Objectives:

- To prepare students for career in civil engineering profession.
- To develop a responsible 'Enterpreneur'.
- To develop the student to cope up with the advancements in Civil.

Programme Outcomes:

- Apply possessed knowledge of fundamental subjects to civil engineering problems.
- analyze civil engineering problems.
- Design civil engineering structures with appropriate consideration to safety,economy, health and environmental considerations.
- Solve complex civil engineering problems by conducting investigations.
- Use modern civil engineering tools, techniques and softwares.
- Apply their professional responsibilities.
- Understand the impact of professional engineering solutions in societal and environmental contexts.
- Exhibit professional ethics and norms of engineering practice.
- Function individually and in teamwork.
- Communicate effectively in both verbal and written forms.
- Manage the work and finance of a civil engineering projects.
- Practice the use of lifelong learning.

Sr. no.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P / D	T	End Semester Exam	Continuous Assessment			TW	Total	TH	TW	Total
						Unit Test	Atten-dance	Assign-ments					
1.	Engineering Mathematics - I	3	-	1	60	20	10	10	-	100	4	-	4
2.	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Graphics *	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Physics	4	2	-	60	20	10	10	25	125	4	1	5
5.	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
6.	Professional Skill Development - I	2	-	-	50	-	-	-	-	50	2	-	2
7.	Computer Applications in Civil Engineering - I	-	2	-	-	-	-	-	50	50	-	1	1
	Total	19	10	1	350	100	50	50	150	700	20	5	25

*End Semester Exam of duration 4 hours.

Sr. no.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P / D	T	End Semester Exam	Unit Test	Atten-dance	Assign-ments	TW	Total	TH	TW	Total
1.	Engineering Mathematics - II	3	-	1	60	20	10	10	-	100	4	-	4
2.	Fundamentals of Mechanical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Mechanics	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1	5
5.	Building Construction	3	2	-	60	20	10	10	25	125	3	1	4
6.	Professional Skill Development - II	2	-	-	50	-	-	-	-	50	2	-	2
7.	Workshop Technology	-	2	-	-	-	-	-	50	50	-	1	1
	Total	19	10	1	350	100	50	50	150	700	20	5	25

<u>Total Credits</u>

Sem -I = 25

Sem -II = 25

Grand Total = 50

ENGINEERING MATHEMATICS – I

TEACHING SCHEME

Lectures	:3 Hrs/week
Tutorial	:1 Hrs/week
Total	:4 Hrs/week

CREDIT

Theory	:3
Tutorial	:1
Total	:4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Total	: 100 Marks

Course Prerequisite

Students should have knowledge about

1. Matrix
2. Complex Numbers
3. Derivatives

Course Objectives

To develop an ability to use the mathematical techniques, skills and tools necessary for engineering practice.

Course Outcomes

At the end of this course, a student will be able to

1. solve the consistency of any type of system.
2. find the roots of equation, using DeMoivre's Theorem and to locate imaginary points using Argand Diagram.
3. apply Leibnitz rule to find n^{th} Derivative.
4. test Convergence and Divergence of infinite series.
5. compute a total derivative.
6. compute Maxima and Mininma of any functiion of two variables

Unit-I

(8 Hours)

Matrices

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Eigen values, Eigen Vectors, Cayley – Hamilton Theorem, Application to problems in Engineering .

Unit-II

(8 Hours)

Complex Numbers and Applications

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations, Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

Unit-III

(8 Hours)

Expansion of Functions and Differential Calculus

Differential Calculus : Successive Differentiation, n^{th} Derivatives of Standard Functions, Leibnitz's Theorem.

Expansion of Functions : Taylor's Series and Maclaurin's Series.

Unit-IV

(8 Hours)

Differential Calculus

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

Infinite Series

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

Unit-V

(8 Hours)

Partial Differentiation and Applications

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables.

Errors and Approximations.

Unit-VI

(8 Hours)

Jacobian

Jacobians and their applications, Chain Rule, Functional Dependence.

Maxima and Minima

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

Text Books

Applied Mathematics (Volumes I and II) by P.N. Wartikar and J.N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune 7th edition(1988).

Assignments

1. Rank , System of linear equations.
2. Complex Numbers.
3. Differential calculus and expansion of functions.
4. Indeterminate forms and infinite series.
5. Partial Derivatives, Euler's theorem on homogeneous functions.
6. Jacobians, Maxima and Minima of functions of two variables.

Reference Books

Advanced Engineering Mathematics by Peter V. O'Neil ,(Thomson Learning) 6th Edition (2007).

Advanced Engineering Mathematics, by M. D. Greenberg, (Pearson Education) 2nd Edition (2002).

Advanced Engineering Mathematics, by Erwin Kreyszig ,Wiley Eastern Ltd. 8th Edition (1999).

Higher Engineering Mathematics ,by B. S. Grewal ,(Khanna Publication, Delhi) 42nd Edition(2012).

Higher Engineering Mathematics , by B. V. Ramana, Tata McGraw- Hill, Edition(2012).

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

FUNDAMENTALS OF CIVIL ENGINEERING

TEACHING SCHEME

Lectures	: 3 Hrs/week
Practicals	: 2 Hrs/week
Total	: 5 Hrs/week

CREDITS

Theory	: 3
Term Work	: 1
Total	: 4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignments	: 10 Marks
Term work	: 25 Marks
Total	: 125Marks

Course Prerequisite

The Students should have the knowledge of

1. Concepts of units and conversions of units.
2. Basic knowledge of Chemistry
3. Basic knowledge of geography, concept of latitude and longitude.

Course Objective

To make student understand the scope and application of Civil Engineering

Course Outcomes

Students will be able to

1. Describe the scope of Civil Engineering and role of Civil Engineer in Construction project.
2. Explain use of surveying instruments for land survey .
3. Explain principles of building planning and bye laws.
4. Describe types of foundations and their stability.
5. Explain methods of irrigation, types of dams, canals, and water and sewage treatment process.
6. Describe the components of infrastructure like roads, railways, bridges and airports.

Unit-I (6 Hours)

Civil Engineering scope and applications

Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.

Unit-II (6 Hours)

Surveying

Objectives , Principles and Classification of Surveying; Linear ,angular ,Vertical and area Measurements and related instruments.

Unit-III (6 Hours)

Building planning and Bye laws

Site selection for residential building; Principles of building planning; Building bye laws-necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.

Unit-IV (6 Hours)

Foundations and Earthquakes

Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation.

Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones .

Unit-V

(6 Hours)

Irrigation and Water Supply

Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.

Unit-VI

(6 Hours)

Infrastructure

Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.

Railways- Types of gauges, section of railway track, components of railway track, advantages.

Bridges : Components - Foundation , Piers, Bearings, Deck.

Airways- Components -Runway , Taxiway and Hangers.

Waterways: components- port, jetty, breakwater.

Term Work

(Term work shall consist of any eight exercises from the list given below.)

1. Study and use of prismatic compass and measurement of bearings.
2. Study and use of Dumpy level and reduction of levels by collimation plane method.
3. Area measurement by Digital Planimeter.
4. Drawing plan and elevation of a residential bungalow.
5. Study of features of topographical maps.
6. Assignment on collection of information on Civil Engineering materials.
7. Assignment on types of foundations.
8. Assignment problem on irrigation and hydropower structures.
9. Assignment on study of flow chart of water and sewage treatment.
10. Assignments on types of transportation systems.

Text Books

1. " Surveying- Vol I " - S.K. Duggal , Tata Mc Graw Hill Publication.
2. "Built Environment" – Shah , Kale, Patki, , Tata Mc Graw Hill Publication
3. "Building Construction" – Dr. B.C. Punmia , Laxmi Publication
4. "Irrigation and water Power Engineering "- Dr. P.N. Modi,Standard Publishers ,New Delhi
5. "Text book of Transportation Engineering "- Arora, Charotar Publishers
6. "Water supply and sanitary engineering-Rangawala, Charotar Publishers
7. "Basic Civil engineering"- M.S. Palanichamy- Tata Mc Graw Hill Publication

Reference Books

1. "Surveying –Theory and Practice"-James Anderson- Tata Mc Graw Hill Publication

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING GRAPHICS

TEACHING SCHEME

Lectures	: 4 Hrs/week
Practicals	: 2 Hrs/week
Total	: 6 Hrs/week

CREDIT

Theory	: 4
Practical	: 1
Total	: 5

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Prerequisites

Students should have basic knowledge of fundamentals of drawing.

Course Objectives

To apply fundamental principles of Engineering Graphics.

Course Outcomes

At the end of this course, a student will be able to understand

1. Different engineering curves and dimensions.
2. Differentiate first angle and third angle projection method in orthographic.
3. To interpret views of object and to draw by using Isometric Projection Method.
4. Projection of lines and its traces.
5. Projection of different planes
6. Projection of solids and its sections.

Unit-I (6 Hours)

Lines and Dimensioning in Engineering Drawing

Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

Unit-II (6 Hours)

Curves used in Engineering Practice

Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.

Projections of Points and Lines and planes

Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP

Unit-III (6 Hours)

Projection of Solids

Projection of prism, pyramid, cone and cylinder by rotation method.

Unit-IV (6 Hours)

Section of Solids

Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.

Unit-V (6 Hours)

Orthographic Projection

Basic principles of orthographic projection (First and Third angle method) . Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.

Unit-VI (6 Hours)

Isometric Projections

Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.

Term work

- Term work shall consist of Seven half-imperial size or A2 size (594 mm x 420 mm) sheets.
- Assignment 05 Problems on each unit in A3 size Drawing Book

Sheets

- Types of lines, Dimensioning practice, Free hand lettering, 1nd and 3rd angle methods symbol.
- Curves and loci of points
- Projections of Points and Lines and planes
- Projection of Solids
- Section of solids
- Orthographic Projections
- Isometric views

Text Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana&P.Kannaiah, Scitech Publications,
   Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

Syllabus For Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING PHYSICS

TEACHING SCHEME		EXAMINATION SCHEME	
Lectures	: 4 Hrs/week	Paper	: 60 Marks
Practicals	: 2 Hrs/week	Unit Test	: 20 Marks
Total	: 6 Hrs/week	Assignment	: 10 Marks
		Attendance	: 10 Marks
CREDITS		Term Work	: 25 Marks
Theory	: 4	Total	:125 Marks
Practicals	: 1		
Total	: 5		

Course Prerequisite

The Student should have basic knowledge of kinematics, electrostatic, wave mechanics and dimensions along with good knowledge of calculus of Higher Secondary level of schooling.

Course Objective

After completing this course the students will able to apply knowledge of Engineering Physics to different branches of engineering for better conceptual clarity and exploring emerging fields of technology and research.

Course Outcomes

1. To use the properties of charged particles to develop modern instruments and explain the mechanism of fusion and fission.
2. To understand the basics of semiconductor and its uses to develop devices such as diode.
3. Students will be capable of applying knowledge of nanoscience to develop new electronic devices.
4. Students will be able to associate the wave nature of light and apply it to measure stress, pressure and dimension etc..
5. To discuss the concept of transverse waves.
6. To judge the problems associated with architectural acoustics and give their remedies and use ultrasonic as a tool in industry for Non Destructive Testing.
7. To understand the behavior of quantum particles in different types of potentials.

Unit-I

(8 Hours)

Modern Physics

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

Nuclear Physics

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron

Unit-II

(8 Hours)

Solid State Physics

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors and in extrinsic semi-conductors (with derivation), Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

Superconductivity

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

Unit-III

(8 Hours)

Thermodynamics

Zeroth law of thermodynamics, first law of thermodynamics, determination of j by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

Nanoscience

Introductions of nanoparticals, properties of nanoparticals (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticals(Physical and chemical), synthesis of colloids, growth of nanoparticals, synthesis of nanoparticals by colloidal route, applications.

Unit-IV
(8 Hours)

Optics - I

Interference

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton’s rings, Engineering applications of interference (optical flatness, non-reflecting coatings, multi-layer ARC).

Diffraction

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

Unit-V
(8 Hours)

Polarisation

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

Lasers

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

Unit-VI
(8 Hours)

Architectural Acoustics

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

Quantum Mechanics

Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Electron diffraction, Davisson and Germer's experiment, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

Term-work :

Experiments

Any eight experiments from the following

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

Text Books

1. Engineering Physics –Gaur and Gupta, Dhanpat Rai Publication
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar, S. Chand Technical

Reference Books

1. Physics for Engineers – Srinivasan M.R., New Age International Publication
2. Engineering Physics- K. Rajagopal, PHI
3. Electronics Principles – A.P.Molvino, Tata McGraw Hill
4. Fundamentals of Optics – Jenkins and White, McGraw Hill

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

FUNDAMENTALS OF ELECTRICAL ENGINEERING

TEACHING SCHEME

Lectures	: 3 Hrs/week
Practicals	: 2 Hrs/week
Total	: 5 Hrs/week

CREDITS

Theory	: 3
Term work	: 1
Total	: 4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignments	: 10 Marks
Term work	: 25 Marks
Total	:125 Marks

Course Pre-requisites :

The Students should have basic knowledge about

1. Mathematics
2. Physics

Course Objectives :

The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments to all first year Engineering students.

Course Outcomes:

1. Understand and apply knowledge of basic concepts of work, power, energy for electrical, mechanical and thermal systems.
2. Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks.
3. Describe construction, principle of operation, specifications and applications of capacitors and batteries.
4. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer.
5. Define basic terms of single phase and three phase ac circuits and supply systems.
6. Know and use electrical safety rules.

Unit-I (6 Hours)

Basic concepts

Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems

Unit-II (6 Hours)

Network Theorem

Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.

Unit-III (6 Hours)

Electrostatics

Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction& working.

Unit-IV (6 Hours)

Magnetic Circuit & Transformer

Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit

Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling,

Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.

Unit-V
(6 Hours)

AC Fundamentals & AC Circuits

AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.

Unit-VI
(6 Hours)

Electrical Wiring and Illumination system

Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED) , Study of Electricity bill.

Term-work :

The term work shall consist of record of minimum eight exercises / experiments.

List of Experiments

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for XL> XC , XL< XC & XL= XC
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
   a)Voltage and current ratios.
   b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

Text Books

1. A Textbook of Electrical Technology Volume- I – B.L.Theraja, S.Chand and Company Ltd., New Delhi.
2. . Basic Electrical Engineering, V. K. Mehta, S. Chand and Company Ltd., New Delhi.
3. Electrical Engineering- G. K. Mittal
4. Theory and problems of Basic Electrical Engineering- I. J. Nagrath and Kothari, Prentice Hall of India Pvt. Ltd.

Reference Books

1. Electrical Technology- Edward Hughes, Seventh Edition, Pearson Education
2. Elements of Electrical Technology- H. Cotton, C.B.S. Publications
3. Basic circuits analysis by John Omalley Shawn Mc Graw Hill.
4. Principles of Electrical Engineering by Del. Toro, PHI

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

PROFESSIONAL SKILL DEVELOPMENT - I

ENGLISH COMMUNICATION

TEACHING SCHEME

Lectures	: 2 Hrs/week
Total	: 2 Hrs/week

EXAMINATION SCHEME

Theory	: 50 Marks
Total	: 50 Marks

CREDITS

Theory	: 2
Total	: 2

Unit I: (5 hours)

Essential Grammar

Tenses: Basic forms and use, sentence formation (general & Technical), Common errors, Parts of speech through context, Direct and reported speech structures and voices.

Unit II: (2 hours)

Vocabulary Enrichment

Exposure to words from General Service List (GSL) by West, Academic word list (AWL) specific technical terms related to the field of technology. Phrases, idioms, significant abbreviations, formal (business) vocabulary.

Unit III: (3 hours)

Written Communication I

Letter Writing – Formal and Informal letter writing, Application letters, Report Writing-Academic and Business reports, Job application letter.

Unit IV: (2 hours)

Phonetics

Pronunciation, Reduction of MTI in spoken English, Question formation with emphasis on common errors made during conversation.

SOFT SKILLS

Unit I: (3 hours)

Communication Skill

a) Importance of effective communication, types of communication- verbal and non verbal, barriers of communication, effective communication

b) Listening Skills: Law of nature- Importance of listening skills, difference between listening and hearing, Types of listening.

Unit II: (3 hours)

Self Awareness & Self Development

a) Self Assessment, Self Appraisal, SWOT, Goal setting - Personal & career - Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self appraisal, Personal Goal setting,

b) Career Planning, Personal success factors, Handling failure, Depression and Habit,

Unit III: (4 hours)

Interpersonal Relationship

Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity

Unit IV: (2 hours)

Time Management

The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan ahead, how to handle interruptions , to maximize your personal effectiveness, how to say “no” to Time wasters.

COMPUTER APPLICATIONS IN CIVIL ENGINEERING-I

TEACHING SCHEME

Practicals	: 2 Hrs/week
Total	: 2 Hrs/week

EXAMINATION SCHEME

Term work : 50 Marks

CREDIT

Practical	: 1
Total	: 1

Course Pre-requisites:

The students should have

1. Basic knowledge of computer components, systems and operating of computer
2. Basic mathematical ability

Course Objectives:

To develop an ability to use MS- Excel and MS- Power Point

Course Outcomes:

1. To solve different problems using M S- Excel
2. To generate various graphs and charts by analyzing the given data in Excel
3. To present different problems in various slides using M S – Power Point

Use of computers in Civil Engineering is increasing day by day. Various analysis and design problems can be solved by preparing the programmes in Microsoft Office Excel. Also to present it properly ,knowledge of Microsoft PowerPoint is required. Use of Microsoft Office Excel and PowerPoint will make the candidate to analyze and present different problems the details of which are as listed below:

Learning Microsoft Excel

- Introduction
- Getting Started
- Data analysis and Calculations using relevant formulae.
- Generate graphs and charts.

Learning Microsoft PowerPoint

- Introduction
- Getting Started
- Preparation of various slides
- Preparing presentation by giving different effects to the data entered.

Term Work

Term work shall consist of 8 assignmentsas follows:

1. Introduction to Microsoft Excel
2. Preparation of Excel Sheets with various solvedequations.
3. Graphical representation of different data.
4. A mini project with Microsoft Excel.
5. Introduction to Microsoft PowerPoint.
6. Preparation of slides.
7. Insertion of clipart, word-art, histograms, different shapes and various charts.
8. A mini project with Microsoft PowerPoint.

Reference Books:

1) "Excel 2013 Bible" by John Walkenbach
2) "Excel 2010 All-in-one For Dummies" by Greg Harvey\
3) "Microsoft PowerPoint 2013 Introduction Quick Reference Guide" by Beezix Inc.

ENGINEERING MATHEMATICS – II

TEACHING SCHEME

Lectures	:3 Hrs/week
Tutorial	:1 Hrs/week
Total	:4 Hrs/week

CREDIT

Theory	:3
Tutorial	:1
Total	:4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Total	: 100 Marks

Course Prerequisite

Students should have basic knowledge about

1. Derivatives
2. Integration

Course Objectives

To develop an ability to use the mathematical techniques, skills and tools necessary for engineering practice.

Course Outcomes

At the end of this course, a student will be able to

1. solve the differential equations of first order and first degree.
2. form mathemtical model of rectilinear motion , electric circuit , fourier heat conduction, newton's law of cooling.
3. represent periodic function as fourier series.
4. evaluate definite Integral by DUIS Rule and to trace cartesian and polar curves.
5. transform the cartesian coordinates into spherical polar and cylindrical coordinate systems.
6. apply methods to find area and volume by double and triple integration.

Unit-I (8 Hours)

Differential Equations (DE)

Definition, Order and Degree of DE, Formation of DE, Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types

Unit-II (8 Hours)

Application of Differential Equations

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat, Chemical engineering problems

Unit-III (8 Hours)

Fourier Series

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

Integral Calculus

Reduction formulae, Beta and Gamma functions.

Unit-IV (8 Hours)

Integral Calculus

Differentiation Under the Integral Sign, Error functions

Curve Tracing

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

Unit-V (8 Hours)

Solid Geometry

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and

Unit-VI (8 Hours)

Multiple Integrals and their Applications

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

Assignments

1.Differential equations.
2.Aplication of differential equations.
3.Fourier series and Integral calculus.
4.DUIS and curve tracing.
5.Solid geometry.
6.Double and triple integrations, area and volume.

Text Books

Applied Mathematics (Volumes I and II) by P.N. Wartikar and J.N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune 7th edition(1988).

Reference Books

Higher Engineering Mathematics ,by B. S. Grewal ,(Khanna Publication, Delhi) 42nd Edition(2012).
Higher Engineering Mathematics , by B. V. Ramana, Tata McGraw- Hill, Edition(2012).
Advanced Engineering Mathematics by Peter V. O'Neil ,(Thomson Learning) 6th Edition (2007).
Advanced Engineering Mathematics, by M. D. Greenberg, (Pearson Education) 2nd Edition (2002).
Advanced Engineering Mathematics, by Erwin Kreyszig ,Wiley Eastern Ltd. 8th Edition (1999).

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

TEACHING SCHEME

Lectures	: 3 Hrs/week
Practicals	: 2Hrs/week
Total	: 5Hrs/week

CREDIT

Theory	: 3
Practical	: 1
Total	: 4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Prerequisites

Students should have the basic knowledge of Thermal Science.

Course Objectives

Students will get the basic knowledge of Mechanical Engineering systems.

Course Outcomes

At the end of this course, a student will be able to understand

1. the fundamentals of thermal engineering.
2. working of power producing and absorbing devices.
3. different energy sources and fundamental laws of heat transfer.
4. the basic properties of fluids and materials.
5. the different mechanical devices and mechanisms.
6. machine tools and manufacturing processes.

Unit-I

(8 Hours)

Thermodynamics

Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)

Unit-II

(8 Hours)

Introduction to I.C. Engines and turbines

Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)

Introduction to refrigeration, compressors & pumps

Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)

Unit-III

(8 Hours)

Energy Sources

Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.

Heat transfer

Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.

Unit-IV
(8 Hours)

Properties of fluids

Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.

Properties of Materials and their Applications

Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.

Unit-V
(8 Hours)

Mechanical devices

Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.

Mechanisms

Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism

Unit-VI
(8 Hours)

Machine Tools

Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.

Introduction to manufacturing processes and Their Applications

Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes

List of experiments:

The Term Work shall consist of any Eight experiments of following list

1 Measurement of viscosity using Redwood viscometer.
2 Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3 Finding relation between input angle and output angle for various link lengths.
4 Study of domestic refrigerator & window air-conditioner
5 Demonstration of operations of centre lathe
6 Demonstration of operations on drilling machines
7 Demonstration of Two stroke and four stroke engine
8 Study of power transmitting elements: Coupling, Gears and bearings
9 Demonstration of pumps and compressor
10 Study and demonstration of different types of clutches.

References

1 Thermodynamics An Engineering Approach: Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2 Applied Thermodynamics for Engineering Technologists: T. D. Eastop and A. McConkey, 5th Edition, Prentice Hall.
3. I.C. Engines Fundamentals: J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4 I.C.Engine : V.Ganeshan, Tata McGraw-Hill, 3rd edition.
5 Strength of Materials: H. Ryder, Macmillians, London, 1969, 3rd edition.
6 Mechanics of Materials: Johston and Beer TMH, 5th edition
7 Mechanisms and Machine Theory: Ambekar A.G., Prentice-Hall of India, 2007.
8 Theory of Machines: S S Rattan, Tata McGraw- Hill, 2nd edition.
9 A Textbook of production engineering: P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
10 Fluid Mechanics & Fluid Power: D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING MECHANICS

TEACHING SCHEME

Lectures	: 4 Hrs/week
Practicals	: 2 Hrs/week
Total	: 6 Hrs/week

CREDIT

Theory	: 4
Practical	: 1
Total	: 5

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignment	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Prerequisites

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

Course Objectives

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

Course Outcomes

At the end of this course, a student will be able to understand

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. Use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

Unit-I (8 Hours)

Resultant and Equilibrium

Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach..

Unit-II (8 Hours)

Truss and Friction

Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts.
Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.

Unit-III (8 Hours)

Centroid and Moment of Inertia

Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.

Unit-IV (8 Hours)

Kinematics of Rectilinear motion of a Particle

Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.

Unit-V (8 Hours)

Kinematics of Curvilinear motion of a Particle

Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.

Unit-VI

(8 Hours)

Kinetics of a Particle

D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.

Practicals

A) The term-work shall consist of minimum Five experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

B)The term-work shall also consist of minimum Five graphical solutions of the problems on different topics.

Reference Books

1. Beer F.P. and Johnston E.R., "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Tata McGraw Hill Publication.
2. Hibbeler R.C., "Engineering Mechanics (Statics and Dynamics)", McMillan Publication.
3. Shames I.H., "Engineering Mechanics (Statics and Dynamics)", Prentice Hall of India (P) Ltd.
4. Singer F.L., "Engineering Mechanics (Statics and Dynamics)", Harper and Row Publication.
5. Meriam J.L. and Kraige L.G., "Engineering Mechanics (Statics and Dynamics)", John Wiley and Sons Publication.
6. Timoshenko S.P. and Young D.H., "Engineering Mechanics (Statics and Dynamics)", McGraw Hill Publication.
7. Bhavikatti S.S. and Rajashekarappa K.G., "Engineering Mechanics", New Age International (P) Ltd.
8. Tayal A.K., "Engineering Mechanics (Statics and Dynamics)", Umesh Publication.
9. Mokashi V.S., "Engineering Mechanics-I and II (Statics and Dynamics)", Tata McGraw Hill Publication.

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

ENGINEERING CHEMISTRY

TEACHING SCHEME

Theory	:	4 Hrs/week
Practicals	:	2 Hrs/week
Total	:	6 Hrs/week

CREDITS

Theory	: 4
Practical	: 1
Total	: 5

EXAMINATION SCHEME

Theory	:	60 Marks
Term Work	:	25 Marks
Unit Test	:	20 Marks
Assignments	:	10 Marks
Attendance	:	10 Marks
Total	:	125Marks

Course Prerequisites

Students should have basic knowledge of

Industrial use of water, crystal structure, fuels, corrosion, electrochemical cell and structure of organic molecules at Higher Secondary level of schooling.

Course Objectives

After completing this course the students will able to apply knowledge of Engineering Chemistry to different branches of engineering for better conceptual clarity and exploring emerging fields of technology and research.

Course Outcomes

At the end of this course, a student will be able to

1. Analyze the methods involved in improving quality of water for domestic and industrial purposes.
2. Express the crystal structure through X-ray diffraction technique to examine the internal structure of crystal.
3. Demonstrate the properties and applications of fossil fuels and derived fuels.
4. Define the fundamental principles of corrosion and methods used for minimizing corrosion.
5. Interpret the basic concepts of electrochemical techniques and its applications in society.
6. Develop the skills for correct stereo chemical assignment and interpretation in complex organic molecules.

Unit-I (8 Hours)

Water

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning , Numerical based on the zeolite process.

Unit-II (8 Hours)

Material Chemistry

Crystallography

Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numericals.

Cement

Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

Unit-III (8 Hours)

Fuels

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

Unit-IV (8 Hours)

Corrosion and its Prevention

Corrosion : Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.
Methods of prevention of corrosion : Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

Unit-V

(8 Hours)

Electrochemistry

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

Unit-VI

(8 Hours)

Stereochemistry

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection,
Geometrical isomerism : cis and trans isomerism, E and Z isomers
Optical isomerism : Mesoform, the number of optical isomers for chiral molecules,
Conformations : conformations of ethane, conformations of n-butane

Term work

Practicals

Any Eight experiments from the following

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer.
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer.
9. Estimation of Copper from brass sample solution by Iodometrically.
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method.
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution .
12. To determine Surface Tension of given liquid by Stalagmometer.
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell.
15. To determine pH of soil .
16. To determine Acidity of soil.

Assignments

1. Effect of hard water on boilers and heat exchangers
2. Hydraulic/ Non-hydraulic cementing materials
3. Analysis of coal a) Proximate b) ultimate analysis of coal
4. Wet corrosion-mechanism, Electroplating, Hot dipping
5. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
6. Fuel cells

References / Text Books

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi.
2. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6^{th} edition (1979)
3. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
4. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
5. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31^{st} Edition (1990)
6. Engineering Chemistry by Dara S. S. Chand Publications
7. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

BUILDING CONSTRUCTION

TEACHING SCHEME

Lectures	: 3 Hrs/week
Practicals	: 2 Hrs/week
Total	: 5 Hrs/Week

CREDITS

Theory	: 3
Practical	: 1
Total	: 4

EXAMINATION SCHEME

Theory	: 60 Marks
Unit Test	: 20 Marks
Attendance	: 10 Marks
Assignments	: 10 Marks
Term Work	: 25 Marks
Total	: 125 Marks

Course Pre-requisites:

The Students should have basic knowledge of
1. Fundamentals of civil Engineering.
2. Concept of Engineering Graphics.

Course Objectives:

To develop the knowledge of building components, materials and construction practices

Course Outcomes:

The student should be able to
1. Understand different types of foundation and masonry.
2. Design staircase .
3. Understand types of Arches and flooring.
4. Understand different methods of building finishes.
5. Know different types of formworks.
6. Understand different properties of construction materials.

Unit-I (6 Hours)

Building Foundations and Masonry

Building foundations: Necessity,Types, Building and its components,
Masonry : Stone, Brick ,Types of bonds in brick masonry, Composite masonry, Hollow and Solid block masonry, Mortars used in construction.

Unit-II (6 Hours)

Doors, Windows and Stairs

Doors: Classification, Terminology used, Frames, Sizes .
Windows :Types , Sizes.
Stairs : Classification , Terminology used ,Design of stairs. Lifts,, Escalators, Ramps.

Unit-III (6 Hours)

Arches, Lintels and Floors

Arches: Classification, Terminology used,, Stability
Lintels :Types, Details of R.C.C. lintels and chhajja.
Flooring: I.S. Specifications, Types , Factors for selection of flooring.

Unit-IV (6 Hours)

Roof Construction

Roofs :Types, Suitability, Roof structures, Selection of roof covering material, Methods of water proofing of roofs, Types of trusses, Fixtures & fastenings

Unit-V (6 Hours)

Building Finishes

Plastering : Methods, tools used, Mortars, Defects ,Plaster of Paris.
Pointing: Types, Methods of pointing
Paints : Types , Textures, Apex, Plastic emulsion , Wall cladding and its Materials

Unit-VI (6 Hours)

Formwork, Scaffolding and Smart Materials

Formwork : Necessity , Materials , Factors for selection , Types.
Scaffolding : Necessity , Materials ,Factors for selection .
Precast concrete , Ferrocrete , Nanoconcrete , Green construction materials, Tremix flooring,Construction Chemicals.

Termwork

Plates- (1/4 imperial size)

1. Symbols of Material & structures
2. Section of wall
3. Brick bonds - English bond, Flemish bond
4. Types of stone masonry
5. Arches - any three
6. Types of steel trusses - any three
7. Paneled Door & Flush doors.
8. M.S. Window, Aluminum Window, Louvers Windows
9. Collection of information brochures related to Construction Material.

Assignment : One from each Unit.

Text Books

1. "Building Construction"-Rangwala,Charotar Publication
2. "The Text Book of Building Construction"-S.P.Arora& S.P.Bindra-DhanpatRai Publication
3. " Building Technology and Valuation"- TTTI Madras,-- Tata McGraw Hill Publication

Reference Books

1) " My Construction Practices "R.B.Chaphalkar.
2) "A to Z" Building Construction" Mantri Publications .
3) "Materials of Construction" – Ghose- Tata McGraw Hill Publications .
4) " Civil engineering Material'- TTTI Chandigarh- Tata McGraw Hill Publications.

Syllabus for Unit Tests

Unit Test I	Unit I ,II & III
Unit Test II	Unit IV, V &VI

PROFESSIONAL SKILL DEVELOPMENT - II

ENGLISH COMMUNICATION

TEACHING SCHEME

Lectures	: 2 Hrs/week
Total	: 2 Hrs/week

EXAMINATION SCHEME

Theory	: 50 Marks
Total	: 50 Marks

CREDITS

Theory	: 2
Total	: 2

Unit I: (4 hours)

Essential Grammar II

Application of tenses, Auxiliaries- correct usage and importance in formal communication, Business Vocabulary - Vocabulary exercises through web-based applications

Unit II: (4 hours)

Written Communication II

Email writing- Formal and Informal email writing structure, Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc. Technical writing, Essay writing, Paragraph writing.

Unit III: (2 hours)

Vocabulary Application

Vocabulary exercises through web-based applications, Usage and application through

Unit IV: (2 hours)

Situational Conversation

Application of grammar and correct spoken English according to context/ situation and application in business scenario.

SOFT SKILLS

Unit I: (3 hours)

Fundamentals Of Effective Communication

Public Speaking: fundamentals of effective public speaking, types- Extempore speech, manuscript speech, and ways to enhance public speaking skills, storytelling, oral review

Unit II: (3 hours)

Presentation Skills

PowerPoint presentations, Effective ways to structure the presentation, importance of body language.

Unit III: (3 hours)

Leadership Skills, Leader's Role, Responsibilities And Skill Required

Understanding good Leadership behaviors, Learning the difference between Leadership and Management, Gaining insight into your Patterns, Beliefs and Rules, Defining Qualities and Strengths of leadership, Determining how well you perceive what's going on around you, interpersonal Skills and Communication Skills, Learning about Commitment and How to Move Things Forward, Making Key Decisions, Handling Your and Other People's Stress, Empowering, Motivating and Inspiring Others, Leading by example, effective feedback.

Unit VI: (2 hours)

Problem Solving Skill

Problem solving skill, Confidence building

Unit V: (4 hours)

Corporate / Business Etiquettes

Corporate grooming & dressing, etiquettes in social & office setting-Understand the importance of professional behavior at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities

WORKSHOP TECHNOLOGY

TEACHING SCHEME

Practicals	: 2 Hrs/week
Total	: 2 Hrs/week

CREDITS

Practical	: 1
Total	: 1

EXAMINATION SCHEME

Term Work	: 50 Marks
Total	: 50 Marks

Course Objectives

Introduction to different materials in engineering practices with respect to their workability, formability & machinability with hand tools & power tools and to develop skills through hands on experience. Special; emphasis shall be given to Safety in Workshop - Fire hazards, electric short circuit –causes and remedies, Machine protection, Human protection, Accident prevention methods, developing ability to observe safe working habits.

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.

Course Outcomes

At the end of this course, students should be able to understand

1. Basic Manufacturing Processes used in the industry,
2. Importance of safety
3. Electrical circuit making.

Carpentry

Introduction to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances Term work includes one job involving joint and woodturning.

Fitting

Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping. Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

Sheet Metal Practice

Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

Joining

Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies. Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

Forging

Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

Moulding

Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

Electrical Board Wiring
(Demonstration Common for Electrical & Non electrical Group)

Electric power utilization, energy audit, Types of wiring - House wiring, stair case wiring, two-way switch wiring, Types of fuses and their uses, circuit breaker, Three phase wiring for electrical motors, earthing, minor fault finding.

Plumbing (Demonstration Common for Electrical & Non electrical Group)

Types of pipe joints, threading dies, Pipe fittings.

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standards of Passing and ATKT Rules:

1. For all courses, both UE(University Evaluation) and IA(Internal Assesement) constitue separate heads-of-passing (HoP). In order to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0(40 % marks) at UE and also a minimum grade point of 5.0 (40 % marks) at IA.

   OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50 % of aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT:

1. A student is allowed to carry backlog of courses prescribed for B. Tech. Sem - I, III , V , VII to B.Tech. Sem-II, IV , VI , VIII respectively.
2. A student is allowed to keep term of Sem-III , if he/she is failing in any number of subjects of Sem - I & II.
3. A student is allowed to keep term of Sem-V , if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem- I & II.
4. A student is allowed to keep term of Sem-VII , if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem-III & IV.

Award of Class for the Degree Considering CGPA:

Award of Honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks(%)
9.50 ≤ CGPA ≤ 10.00	O	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks ≤ 80
8.00 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks ≤ 70
7.00 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks ≤ 60
6.00 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks ≤ 55
5.00 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks ≤ 50
CGPA Below 5.00	F	Fail	Marks Below 40

BHARATI VIDYAPEETH DEEMED UNIVERSITY
Pune.

Faculty of Engineering & Technology
Programme : B. Tech. (Civil)

COURSE STRUCTURE AND SYLLABUS
(Choice Based Credit System - 2014 Course)

B. Tech. (Civil) (Sem III & IV)

Vision :

Provide high quality technical manpower to the industry and nation.

Mission :

Social Transformation Through Dynamic Education

Goals :

a) To create work place environment that attracts and retains superior and diversified faculty members.

b) To adopt policies to promote faculty development programmes.

c) To gather, support and collaboration for research activities in emerging technologies and interdisciplinary studies.

d) Constant reform and upgradation of curricula to keep pace with rapidly advancing technology trends.

e) Development of centre of excellence in Engineering and Technology.

f) Strengthen the interaction with R & D and industry organizations.

g) Accelerate the process of sharing knowledge, infrastructure and resources for better tomorrow.

h) Enhance the facilities necessary for training, testing and consultancy services.

BHARATI VIDYAPEETH DEEMED UNIVERSITY
Pune.

Faculty of Engineering & Technology
Programme : B. Tech. (Civil)

COURSE STRUCTURE AND SYLLABUS
(Choice Based Credit System - 2014 Course)
B. Tech. (Civil) (Sem III & IV)

Bharati Vidyapeeth, the parent organization of this University is one of the largest educational organizations in the country. It has 171 educational units under its umbrella including 67 Colleges and Institutes of conventional and professional education.

The Department of Human Resource Development, Government of India on the recommendations of the University Grants Commission accorded the status of "Deemed to be University" initially to a cluster of 12 units of Bharati Vidyapeeth. Subsequently, 17 additional colleges / institutes were brought within the ambit of Bharati Vidyapeeth Deemed University wide various notifications of the Government of India. Bharati Vidyapeeth Deemed University commenced its functioning on 26th April, 1996.

Constituent Units of Bharati Vidyapeeth Deemed University

1. BVDU Medical College, Pune.
2. BVDU Dental College & Hospital, Pune
3. BVDU College of Ayurved, Pune
4. BVDU Homoeopathic Medical College, Pune
5. BVDU College of Nursing, Pune
6. BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
7. BVDU New Law College, Pune
8. BVDU Social Sciences Centre (M.S.W.), Pune
9. BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
10. BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
11. BVDU College of Physical Education, Pune.
12. BVDU Institute of Environment Education & Research, Pune
13. BVDU Institute of Management & Entrepreneurship Development, Pune
14. BVDU Poona College of Pharmacy, Pune
15. BVDU College of Engineering, Pune
16. BVDU Interactive Research School in Health Affairs (IRSHA), Pune
17. BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
18. BVDU College of Architecture, Pune
19. BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
20. BVDU Institute of Management, Kolhapur
21. BVDU Institute of Management & Rural Development administration, Sangli
22. BVDU Institute of Management & Research, New Delhi
23. BVDU Institute of Hotel Management & Catering Technology, Pune

24. BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
25. BVDU Medical College & Hospital, Sangli
26. BVDU Dental College & Hospital, Mumbai
27. BVDU Dental College & Hospital, Sangli
28. BVDU College of Nursing, Sangli
29. BVDU College of Nursing, Navi Mumbai

The status of University was given to a cluster of these colleges and institutes in appreciation of the high level of their academic excellence and for their potential for further growth.

During the last 20 years or so, the University has achieved higher pinnacles of academic excellence and has established its reputation to such an extent that it attracts students not only from various parts of India but also from abroad. According to a survey conducted by Association of Indian Universities, this University is one among the top ten Universities in the country preferred by the overseas students for admissions. At present, there are more than 850 overseas students from 47 countries on the rolls of constituent units of this University.

During the last 20 years, there has been tremendous academic expansion of the University. It now conducts in all 305 courses in its constituent units, of them 108 are Post Graduate, 45 are Under Graduate and 55 Diploma level courses, 12 Fellowship and 5 certificate courses. All the professional courses which the University conducts such as those of Medicine, Dentistry, Engineering etc., have approval of the respective statutory councils, viz., Medical Council of India, Dental Council of India, All India Council for Technical Education etc.

The University is a throbbing center of research activities and has launched Ph.D. programmes in 77 subjects and M.Phil in 3 subjects. It has also introduced quite few innovative academic programmes such as Masters in Clinical Optometry, M.Tech. in Nano Technology etc.

The University's performance and achievements were assessed by the "National Assessment and Accreditation Council" and it was reaccredited with a prestigious "A" grade in 2011. Some programmes of the constituent units such as College of Engineering at Pune, Management Institute in Delhi and others have also been accredited by "National Board of Accreditation". Three constituent units of Bharati Vidyapeeth Deemed University are also the recipients of ISO 9001-2001 certifications.

College Information :

Bharati Vidyapeeth University College of Engineering, Pune (BVUCOE) established in 1983, a constituent unit of BVU (University with 'A' Grade status by MHRD, accredited to Grade 'A' by NAAC in 2004 and 2011) and holds a place of pride and is amongst the most reputed institute. It has been ranked to 61st by National Institutional Ranking Framework (NIRF) with criteriawise ranking as 5th in Graduate Outcome (GO), 13th in Outreach and Inclusivity (OI), 44th in Teaching Learning Resources (TLR) and 62nd in Perception (PR). This also made institute to stand 4th in the State of Maharashtra. Further, DATAQUEST-CMR national survey also ranked this institute to 4th among private technical institutions of India, 29th by Times of India and 41st by OUTLOOK. This is the only institute selected by MHRD for its Technical Education Quality Improvement Programme (TEQIP-II – 1.1 Programme) for the grant of Rs. 4 Crores.

BVUCOE, Pune offers 09 graduate, 08 post graduates programmes and Doctoral programmes in 08 disciplines. All Programmes are accredited by National Board of Accreditation (NBA) twice and we have applied for third cycle of accreditation.

Institute has its own spacious well designed building measuring 26,286 sq. m. and it houses 101 labs, 43 class rooms, and 21 tutorial rooms. The library of the institute is a five storied building and houses periodical section, computer center, reading hall, reference section. It contents more than 60,000 books, 15,000 volumes, 80 national and 81 international journals subscription and digital library facility. Digital library of institute with 66,944 number of journals in e-form is one of the richest source of knowledge in e-form for students and faculty members. The Library, Laboratories, Equipments, Learning resources and Software constantly get upgraded and updated in tune with the changing time. An Investment of Rs.119.95 million is made in the last five years.

The structured faculty development programme has strengthened quality of Teaching - Learning Process in the institute. 35 faculty members with Ph. D. qualifications have been proved as resources for research, innovations and sound Teaching – Learning Process. As a part of quality improvement programme 04 number faculty members were deputed to International Universities, Institutions of national importance such as IIT, NIT etc. for qualification improvement. Team of 206 faculty members with average experience 11.7 years and average age 38.3 years indicates teachers with fine blend of experience and youth. Faculty members are well conversant and trained for use of latest softwares and latest equipments being purchased every year as policy of upgrading laboratories. In last five years college has invested Rs. 119.95 million in laboratory upgradation. Institute organized 138 number of continuing education programmes in last five years to keep sharpen skills of faculty members. Further, 1389 faculty members were deputed to attend various workshops and training programmes for sharing and enhancing their knowledge. Faculty members also play active role in curriculum development as Member of Board of Studies of various subjects and other statutory bodies of the University.

The research quality is indicative of the university penchant for quality. The research publications in reputed international and national refereed journals and conferences have shown a steady and significant rise over the years which is aptly reflected by 1091 Research papers publications in reputed national and international journals in last five years. Grant

of Rs. 152.73 Lakhs from funding agencies such as UGC, DST, DRDO, AICTE etc. fetched by faculty members is strong indicator of research aptitude of faculty members. Seed money up to Rs. 3 lakhs under Institutionally Funded Research Programme (IFRP) nurtures research aptitude of faculty members. 575 number of publications in standard research databases such as SCOPUS, Web of Science, Google Scholar etc. in last five years throws light on quality of publications by faculty members of this institute. These publications by faculty members have received 137 number of citations in the same period. Institute has 02 patents to its credit and filed 05 patents.

The institute has collaboration with international universities such as North Carolina A & T State University, Greensboro, USA, Joint School of Nanoscience and Nanoengineering (JSNN), USA, The University of Tokushima, Japan, ARM University, USA and with industries such as TCS, SKF India Ltd. Every year one faculty member is deputed for Ph. D. programme in NCAT with scholarship. Students of M. Tech. (Nanotechnology) joins JSNN, USA to pursue their dissertation research work for six months with scholarship to the tune of $1000 per month. Further, NCAT, USA, The University of Tokushima, Japan contributes intellectually as well as financially to organize biannual international conference NANOCON. Three editions of NANOCON are conducted since 2010 with their association. In association with Eduvance & GAATsis, a " Center of Excellence in Embedded Systems" is established in the Institute with donation of Educational kits like ARM development boards from ARM University Program and PSoC kits by Cypress Semiconductors are used for developing projects in the sponsored laboratory. TCS supports students and faculty members for faculty enablement programmes and student development programme. Establishment of Lubricant Conditioning Monitoring Laboratory is outcome of collaboration with SKF India Ltd.

Being Deemed University college takes advantage of academic autonomy in making the curriculum industry oriented and enable students to make employable. In-plant training (45 days), courses such as Professional Skill Development introduced as integrated part of course structure. In-plant training enable students to interact within their associated industries for gaining practical field experience and professional exposure. Curriculum is Choice Based Credit System which makes students path of joining international universities for their higher studies smoother.

Today, qualitative soft skill development in students is more pertinent to a student's professional career. The institute regularly arranges training programme in the area of personality development, aptitude test, group discussion and personal interview. Through its Employment Enhancement Programme (EEP) designed for third year students which comprises of communication skill quantities analysis, corporate culture, IT Training and soft skills. This programme is conducted in association with professional institutes of national repute for effective execution and implementation. To enhance their professional experience and get them head start in the industry, an innovative programme is initiated on student mentoring "Saturday @ BV", wherein speakers are entrepreneurs and high ranked corporate who share their experiences, hardship and their corporate journey.

In it's long, multi-pronged, persistent and pain staking efforts for producing quality engineering professionals, institute has produced more than 1068 entrepreneurs.

PROGRAMME : CIVIL ENGINEERING

Vision:

To Create Civil Engineers who will transform Civil Engineering Industry for sustainable development of society.

Mission:

Create responsible Civil Engineers to meet global challenges.

Programme Education Objectives (PEO)

PEO1: To prepare students for career in Civil Engineering profession.

PEO2: To develop a responsible 'Entrepreneur'.

PEO3: To develop the student to cope up with the advancements in Civil Engineering.

Program Outcomes (PO)

The Graduates will be able to

1. apply possessed knowledge of fundamental subjects to Civil Engineering problems.
2. analyze Civil Engineering problems.
3. design Civil Engineering structures with appropriate consideration to safety, economy, health and environmental considerations.
4. solve complex civil engineering problems by conducting investigations.
5. use modern civil engineering tools, techniques and softwares.
6. apply their professional responsibilities.
7. understand the impact of professional engineering solutions in societal and environmental contexts.
8. exhibit professional ethics and norms of engineering practice.
9. function individually and in teamwork.
10. communicate effectively in both verbal and written forms.
11. manage the work and finance of a Civil Engineering projects.
12. practice the use of lifelong learning.

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW &Oral	TW& Practical	Total	Theory	TW	Total
15	Building Planning, Design and Byelaws*	3	2	--	60	20	10	10	50	--	150	3	1	4
16	Applied Geology	3	2	--	60	20	10	10	--	50	150	3	1	4
17	Engineering Economics & Financial Accounting	3	-	-	60	20	10	10	--	---	100	3	--	3
18	Mechanics of Solids	4	--	1	60	20	10	10	---	---	100	5	-	5
19	Concrete Technology	3	--	--	60	20	10	10	--	----	100	3	-	3
20	Professional Skill Development-III	4	--	--	100	---	----	--	--	----	100	4	-	4
21	Computer Applications in Civil Engineering-II	---	2	--	---	--	---	---	---	50	50	---	1	1
22	Testing of Materials	--	2	--	--	--	--	--	50	---	50	--	1	1
	Total	**20**	**08**	**01**	**400**	**100**	**50**	**50**	**100**	**100**	**800**	**21**	**4**	**25**

* End Semester Exam of duration 4 hours.

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
23	Engineering Mathematics-III	3	--	1	60	20	10	10	--	---	100	4	-	4
24	Surveying	3	4	--	60	20	10	10	--	50	150	3	2	5
25	Mechanics of Fluids	3	2	--	60	20	10	10	50	----	150	3	1	4
26	Construction Techniques and Machinery	3	--	--	60	20	10	10	---	----	100	3	-	3
27	Structural Analysis- I	3	--	--	60	20	10	10	---		100	3	-	3
28	Professional Skill Development-IV	4	--	--	100	--	--	--	--	---	100	4	--	4
29	Computer Applications in Civil Engineering-III	---	2	--	---	--	---	---	---	50	50	---	1	1
30	Civil Engineering Construction Practice	--	2	--	--	--	--	--	50	----	50	--	1	1
	Total	**19**	**10**	**01**	**400**	**100**	**50**	**70**	**100**	**100**	**800**	**20**	**5**	**25**

Total Credits
Semester V = 25
Semester VI = 25
Grand Total = 50

15 : BUILDING PLANNING DESIGN AND BYELAWS

TEACHING SCHEME:	**CREDITS ALLOTED**
Theory : 3 Hours/ Week	Theory : 03 Credits
Practical : 2 Hours/ Week	TermWork : 01 Credit

Course Pre-requsites

The Student Should have knowledge of

1 Fundamentals of Civil Engineering

2 Building Construction Practices

Course Objective

To make the student understand the process of building planning and building byelaws

Course Outcomes

Student will be able to

1 describe various types of buildings, their planning and building byelaws.

2 apply design considerations for climate, ventilation and lighting in building planning.

3 apply design considerations for Noise & acoustics, fire protection, Electrical & telecommunication and circulation in building planning.

4 apply design considerations for plumbing services in building planning.

5 explain the legal aspects of plan sanctioning.

6 explain the role of town planning authority and various presentation drawings.

Unit -I (06 Hours)

Buildings, Types, Planning and Regulations

Types of Residential Building units – Bungalows, Twin bungalows, Row houses, Apartments; Requirements of Public buildings - Educational buildings, buildings for health care, industrial buildings and commercial buildings; Principles of planning for building, Integrated approach necessity. Building Rules Regulations and Byelaws necessity, plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation; Types of drawings - Submission drawings, working drawings and Architectural drawing.

Unit II (06 Hours)

Building Services I

(a) Climate - elements of climate, global climate, thermal design Principles, comfort sectors, Heat exchange of building. Thermal insulation of roof and wall.

(b) Ventilation and lighting - comfort factors, function of ventilation, stack effect wind effect. Mechanical ventilation, ventilation rate, Air conditioning-design data, cooling load, Air conditioning systems.

(c) Noise and acoustics –Effect of noise, comfort standards, Noise control sound insulation, Acoustics reverberation Sabines formula acoustical defects conditions of good acoustics.

Unit III (06 Hours)

Building Services II

(a) Plumbing services, fixtures and fastenings, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems,

(b) Fire Protection – Fire safety, fire load, grading of occupancies by fire load, fire escape elements.

(c) Constructional requirements for different building services like Electrical, Telecommunication services, Circulation-Lift escalators, Entertainment services.

Unit IV (06 Hours)

New Planning Concepts of Buildings

Layout plans of different types of buildings, Design and planning of ECO Friendly building, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings.

Unit V (06 Hours)

Legal Aspects of Plan Sanctioning

Role of Plan Sanctioning Authority for layout, co-op Housing societies and apartments. Ownership of land, plot, 7/12 abstract, meanings of different terms of 7/12 abstract, 6-D form, list of documents to be submitted along with building Plan for sanction from the authority. TDR, certificate of commencement and completion, various no objection certificates to be produced, format of permissions from pollution control board, MSEB, Water Supply and Drainage Department, State or National Highway Department.

Unit VI (06 Hours)

Town Planning and Presentation drawings

(a) Necessity of town planning in India. Importance of safety, amenities and services, Development plan, Land use- zoning: Introduction to different zones of land in town planning, Requirements of residential zone, commercial industrial and agricultural zone, open areas, green belts and parks.

b) Axonometric, Perceptive-One point and Two point.

Term work shall consist of :

1. Preparation of working drawings of any one of the buildings listed below:

a) Residential Building
b) Commercial Building
c) Educational Building
d) Industrial Building
e) Recreational Building
f) Health Club

2. Sheets to be drawn
   a) Plan/Typical floor plan to a suitable scale.
   b) Elevation and section to a suitable scale.
   c) Site plan showing water supply and Drainage
   d) Foundation Plan to a suitable scale.
3. Line plan of remaining five buildings from 1.
4. Perspective Drawing of different objects.

Assignments

1 Study of building bye laws and D.C. rules of local authority
2 Study of different types of drawings.
3 Data collection with respect to climate , ventilation and lighting in building planning.
4 Study of various components of water supply and drainage system of buildings.
5 Case studies with respect to fire fighting of high rise building.
6 Case studies with respect to lift and escalators.
7 Constructional requirements with respect to electrical services in buildings.
8 Case studies of Ecofriendly and intelligent buildings.
9 Collecting information about legal aspects of building planning.
10 Writing report on development plan.

Text Books

1. Bindra Arora, “Building Construction”, Laxmi Publication

2. M. L. Shah, C. M. Kale, S. Y. Patki, “Building Drawing with integrated approach to Built Environment”, Tata McGraw Hill Publishers
3. Rangwala, “Town Planning” , Charaotar Publications

References Books :

1. IS provisions “National Building Code”
2. “Development Control Rules” of local plan sanctioning authority
3. Calendar, “Time Saver Standards for Architectural Design”, Tata McGraw Hill Publishers
4. Merit, “Building Design and Construction”, Tata McGraw Hill Publishers

Syllabus for Unit Test

Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

16 : APPLIED GEOLOGY

TEACHING SCHEME	CREDITS ALLOTTED
Theory: 03 Hours / Week	Theory : 03 Credits
Practical: 02 Hours / Week	Termwork : 01 Credit

Course Pre-requisites

The Students should have basic knowledge of

1. Engineering sciences

Course Objectives

To make students understand physical geology, mineralogy, petrology, structural & Indian geology,surface & sub surface water, geological investigation for tunnel,dam,reservoir & bridge

Course Outcomes

Students will be able to

1. explain Geology of Mountain earthquakes & volcanism to decide the location ,type of foundation and type of civil engineering structure
2. identify different rocks & minerals.
3. identify different Geological structures to decide location and type of civil engineering structure.
4 determine influence of texture & structures of rocks on occurance of Ground water and Geology of river
5 explain surface and sunsurface investigation for tunnels.
6 explain geological aspects at Dams, Reservoir and Bridges.

UNIT - I (06 Hours)

Physical Geology & Introduction to Engineering Geology

Origin of Earth, Surface Relief of the earth, Earth Movement, Earthquake, Interior of the Earth, Volcanocity: Product of Volcanoes, types of mountains, Different Branches of Geology, Engineering Geology as a Subject.

UNIT - II (06 Hours)

Mineralogy and Petrology

Mineralogy: Formation Process of Minerals, Types of Minerals, Classification of Minerals.

Petrology- Rocks & minerals, Igneous rocks- mineral composition, texture, classification of igneous rock, study of common rock types, secondary rocks-weathering, texture & structure of sedimentary rocks & its classification, metamorphic rocks, agents & types of metamorphism, metamorphic textures Building stones.

UNIT - III (06 Hours)

Structural Geology & Indian Geology

Structural Geology- Outcrop, dip & strike, conformable series, unconformity & overlap, faults & folds in rocks, mode of occurrence of igneous rocks, joints & fractures.

Indian Geology- General Principles of stratigraphy, age of the earth & divisions of geological time, physiographic divisions of India & their characteristics, geological history of peninsula, study of formation in peninsula.

UNIT - IV (06 Hours)

Water: Surface & Sub Surface

Surface Water: Geological action of running water, river valley development, normal & regional cycle of river erosion, waterfalls, ox-bow lakes, flood plane deposits, deltas, rejuvenation & resulting features,.

Sub - Surface Water: Types of Groundwater, depth zones of groundwater, perched water table, pervious & impervious rocks, geological work done by groundwater, natural springs & seepages, effect of pumping, cone of depression, circle of influence, conservation of groundwater, artesian wells, water bearing capacity of common rocks.

UNIT - V (06 Hours)

Geological Investigations

Preliminary geological investigations- use of geological maps & sections, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts etc., limitation of drilling, engineering significance of geological structures,

Tunneling- Influence of geological condition on design & construction method, preliminary geological investigations for tunnels, important geological considerations while choosing alignment, difficulties during tunneling, as related with lithology, nature & structure of materials to be excavated, role of groundwater, geological conditions likely to be troublesome, suitability of common rock types for tunneling, case studies.

UNIT - VI (06 Hours)

Geological Aspects at Dams, Reservoirs & Bridges

Geology of dam site- preliminary geological work at dam site, influence of geological condition on the choice of types & design of dam, favourable & unsuitable geological conditions for locating a dam i.e. landslide, treatment of leaky rocks & geological structures, case studies.

Geology of reservoir sites- Dependence of water tightness on physical properties & structures of rocks, geological conditions suitable & unsuitable for reservoir sites, conditions likely to cause leakage through reservoir rim, importance of groundwater studies & effect of rising of water table, case studies.

Geology of Bridge Sites- Preliminary geological exploration for bridge piers & bridge abutments, scouring & erosion around bridge piers, influence of nature & structure of rocks on bridge foundation, case studies.

List of Practical's / Term work

1) Identification of the Minerals (Two Practical)
2) Identification of Igneous rocks (One Practical)
3) Identification of Secondary rocks (One Practical)
4) Identification of Metamorphic rocks (One Practical)

5) Study of Contoured Geological Maps & drawing the sections (Five Practical)

6) Visit to site of Dam / Tunnel for understanding the geological features.

List of assignment :

1. Assignment on Earthquakes, Volcanoes and interior of Earth.
2. Assignment on Minerals and rocks.
3. Assignment on folds and faults.
4. Assignment on geological work of river and ground water.
5. Assignment on surface & sub-surface investigations.
6. Assignment on Engineering Geological study of Dams & bridges.
7. Asssignment on Good Building stones.
8. Assignment on rejernation of river.

Reference Books :

1) Gupte R. B., “A Text Book of Engineering Geology”, P. V. G. Publications, Pune

2) Legget R., “Geology and Engineering”, McGraw Hill Book Co., London

3) Trefethen J. M., “Geology for Engineers”, D Van Nostrand Co. Inc.

4) Schultz J. R. and A. B. Cleaves, “Geology in Engineering”, John Wiley Inc.

5) Engineering Geology & General Geology by Parbin Singh.

6) General Geology & Engineering Geology by Dr. P. T. Sawant, New Delhi Publication.

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

17 : ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

TEACHING SCHEME | **CREDITS ALLOTTED**

Theory: 03 Hours / Week | Theory : 03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Basic concept of Civil Engineering
2. Basics of Mathematics

Course Objectives

To make students understand Engineering Economics and Financial Management

Course Outcomes

Student will be able to

1. draw organization chart.
2. find out time value of money.
3. select best project.
4. find out depreciation cost.
5. prepare balance sheet.
6. generate finance for his organization.

UNIT - I (06 Hours)

Elementary Economics

Definition of Economics, nature, scope and importance of Engineering economics, basic economics concept-Human wants. Utility, value, cost, price, profit, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labor, capital and organization.

UNIT - II (06 Hours)

Engineering Economics.

Basic principles, time value of money, cash flow diagram. Equivalence-single payment in the future, present payment compare to uniform series payment. Future payment compare to uniform series payment.

UNIT - III (06 Hours)

Project Economics Analysis

Comparison of alternatives, net present value present, future and annual worth method of comparing alternatives, internal rate of return. Break even analysis. Benefit cost ratio

UNIT - IV (06 Hours)

Depreciation and Value Engineering.

Depreciation and methods of depreciations. Inflation, value engineering and value analysis.

UNIT - V (06 Hours)

Finance Management

Financial management, construction accountancy charts of accounts, financial statement, profit and loss account, balance sheet, insurance audits and financial risk aspects

UNIT - VI (06 Hours)

Project Budgeting

Types of capitals, fix and working capital, debentures, shares, public deposits. Forms of foreign capital, money and capital market in India. New economical policy. Role of financial institutions in economical development, RBI government of India guidelines for foreign funding in construction projects.

Assignments :

1. Scope and importance of Engineering Economics.
2. Numericals on time value of money.
3. Numericals on Economic analysis of project by different methods.
4. Break Even Analysis.
5 Methods of depreciation and value analysis.
6. Preparation of Balance Sheet.
7. Investments in Infrastracture development Capital.

Reference Books :

- Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.
- Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.
- Boyer, C. B. and Merzbach, U. C., "A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989.
- Gould, F. E., "Managing the Construction Process", 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.
- Gransberg, D. G., Popescu, C. M. and Ryan, R. C., "Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.
- Harris, F. , McCaffer, R. and Edum-Fotwe, F., "Modern Construction Management", 6th ed., Blackwell Publishing, 2006.
- Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2011.
- Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., "Engineering Economic Analysis", Indian Edition, Oxford University Press, 2010.
- Ostwald, P. F., "Construction Cost Analysis and Estimating", Prentice Hall, Upper Saddle River, New Jersey, 2001.
- Peterson, S. J., "Construction Accounting and Financial Management", Pearson Education, Upper Saddle River, New Jersey, 2005.
- Peurifoy, R. L., Schexnayder, C. J. and Shapira, A., "Construction Planning, Equipment, and Methods, 7th ed., Tata McGraw-Hill, New Delhi, 2010.
- Peurifoy, R. L. and Oberlender, G. D., "Estimating Construction Costs", 5th ed., McGraw-Hill, New Delhi, 2004.
- Schexnayder, C. J. and Mayo, R. E., "Construction Management Fundamentals", International Edition, McGraw-Hill, 2003.

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

18 : MECHANICS OF SOLIDS

TEACHING SCHEME
Theory: 04 Hours / Week

CREDITS ALLOTTED
Theory : 04 Credits

Course Pre-requisites

The Students should have knowledge of "Engineering Mechanics".

Course Objectives

To make student able to calculate stresses developed in the material.

Course Outcomes

The student should be able to

1. calculate stresses due to axial force.
2. Calculate shear force and bending moment in the beam.
3. Calculate deflection and bending stress in the beam.
4 Calculate shear stress due to shear force and torsion.
5 Calculate critical load for column.
6 Calculate principal stresses.

UNIT - I **(08 Hours)**

Simple Stresses and strains

Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law;

Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section.

UNIT - II **(08 Hours)**

Shear Force and Bending Moment in Beams

Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments;

UNIT - III **(08 Hours)**

Deflection of beam and bending stresses

Deflection of Beams: Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.

Flexural Stresses: Theory and assumptions of pure bending; Moment of resistance; flexural formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section.

UNIT - IV **(08 Hours)**

Shear Stresses

Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section.

Torsion of Circular Shafts: Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.

UNIT - V **(08 Hours)**

Combined stresses and axially loaded column

Combined Axial and Bending Stress: Concept; Resultant stress due to the axial load and uni-axial or biaxial bending; Core of section.

Axially Loaded Long Columns

Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula.

UNIT - VI **(08 Hours)**

Principal Stresses and Principal Planes

Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method. (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.

Assignments :

1. Assignment on Stress & Strain recent three years of BVU question papers.
2. Assignment on S.F.D & B.M.D problems on plates (Three various types of problems).
3. Assignment on Macaulay's method problems.
4. Assignment on Shear stress & Torsion problems of various problems.
5. Assignment on Column (Eulers & Rankine's) Problems.
6. Assignment on Mohr's circle method (Graphical & Analytical Methods)
7. Assignment on Deflection of beam (Types)
8. Assignment on Bending stresses.

Text Books

R. C. Hibbeler, "Mechanics of Materials", Pearson Prentice Hall,

Rajput R. K., "Strength of Materials", S. Chand Publication

Punmia B. C., Jain, Ashok Kr. Jain Arun Kr., "Mechanics of Materials", Laxmi Publication.

Ramamrutham S. & Narayan R., "Strength of Materials", Dhanpat Rai Publishing Co.

Reference Books

Beer F..P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication

GereJ.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors

Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication

Popov E. P., "Engineering Mechanics of Solids", Prentice Hall of India (P) Ltd.

Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

19 :CONCRETE TECHNOLOGY

TEACHING SCHEME | **CREDITS ALLOTTED**

Theory: 03 Hrs / Week | Theory : 03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Fundamentals of Civil Engineering
2. Engineering Chemistry

Course Objectives

To make student to know qualities & properties of concrete.

Course Outcomes

The student will be able to

1. Tests Ingredients of concrete.
2. Measure Workability of concrete.
3. Measure strength of concrete.
4. Design concrete Mix.
5. Measure Durability of concrete.

UNIT - I **(06 Hours)**

Ingredients of Concrete:

Cement: Manufacture of Portland cement, Chemical Composition, Bogues compounds, Hydration of cement, Structure of Hydrated cement, ASTM classification and types of cement, Tests of cement and I.S. requirements for ordinary Portland cement.

Aggregates: Classification, Properties of aggregates, Deleterious materials, Soundness, Alkali-Aggregate Reaction, Grading of aggregates, Standard Grading curves, Testing of aggregates, Artificial & recycled aggregates. Water: Quality of water IS requirements, Use of sea water.

UNIT - II **(06 Hours)**

Fresh Concrete

Workability: Factors affecting workability, Measurements of workability, Suitability of concrete based on degree of workability, Segregation, bleeding.

Concreting Process: batching, mixing, transporting, placing and compaction.

Curing of Concrete: Methods of curing (study of machinery not expected), Effect of temperature on curing, Steam curing, curing compounds, period for curing, stripping time.

UNIT - III **(06 Hours)**

Hardened Concrete:

Properties of Hardened concrete

Strength of Concrete: General, Compressive strength, Factors affecting strength, Maturity Concept, Tensile strength, Relation between compressive and tensile strength, Flexural strength, Testing under central and third point loading, Shear strength, Bond strength,Elasticity, Creep and Shrinkage: Stress-Strain relation, Modulus of Elasticity, Creep-time curve.

Non Destructive Testing: Schmidth's Rebound hammer, Ultrasonic Pulse velocity method.

UNIT - IV **(06 Hours)**

Concrete Mix Design

Concept of mix design, Variables in mix design, Statistical Quality Control, Various methods of mix design, Design of mix by Indian Standard recommended method (IS: 10262 & IS: 456), Acceptance criteria.

UNIT - V **(06 Hours)**

Admixtures in Concrete

Purpose and functions, Classification, Chemical Admixtures: Plasticizers, Super-Plasticizer, Retarders, Air entraining agents, Compatibility of admixtures and cement, Marsh Cone Test.

Mineral Pozzolanic/Admixtures:- Fly ash, Silica flume.

Self Compacting Concrete, Roller Compacted Concrete, Ready mix concrete; High Performance Concrete.

UNIT - VI **(06 Hours)**

Special Concrete and Durability of Concrete

Special Concrete: Light weight concrete, Polymer Concrete, Fiber reinforced concrete, Ferro-cement.

Special Concreting: Under water concreting, Cold weather concreting.

Durability of Concrete: Definition, Significance, Strength and durability relationship; Permeability, Chemical attack; Sulphate attack; Chloride attack, attack by sea water, Carbonation and measurement of depth of carbonation, Requirement for durability as per IS 456.

Assignments :

1. Assignment based on ingredients of concrete.
2. Assignment based on properties of concrete.
3. Assignment based on properties of aggregates.
4. Assignment based on testing of fresh concrete.
5. Assignment based on testing of hardened concrete concrete.
6. Assignment problem based on concrete mix design.
7. Assignment based on admixtures of concrete.
8. Assignment based on special concrete.

Text Books

1) Gambhir M. L., “Concrete Technology”, Tata McGraw Hill Publication
2) Shetty M. S., “Concrete Technology”, S. Chand & Company Ltd.

Reference Books

1) Neville A. M. & Brooks J. J., “Concrete Technology”, Pearson Education Publication
2) Neville A. M., “Properties of Concrete”, ELBS & Longman Publication

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III
Unit Test -2 UNIT – IV, V, VI

20 : PROFESSIONAL SKILL DEVELOPMENT III

TEACHING SCHEME	CREDITS ALLOTED
Theory: 4 Hours / Week	Theory : 4 Credits

Course Pre-requisites

The Students should have knowledge of

1. Basic math's and reasoning, the rules of English and comprehensive ability
2. Basic awareness of phrasal verbs used in spoken communication and knowledge of verbs and other words used in professional life.
3. Basic writing techniques taught to them in the first semester.
4. The strengths and achievements analyzed during self awareness session taught in the second semester. They should also be able to identify their long term and short term goals.
5. Basic knowledge and idea about leaders and leadership qualities.
6. Basic awareness of PowerPoint presentation and paper presentation and also should be fluent in English.

Course Objectives

The Professional Skills Development course which is a combination of aptitude and soft skills aims to augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time. The English and soft skills section focuses on the higher aspects of soft skills such as grooming them on leadership, presentation, business communication which would enable them to project themselves as professionals in the corporate sector and/or otherwise.

Course Outcomes

The student will be able to

1. Solve the aptitude test in the recruitment exam and competitive exam by applying short techniques and solve the question in less amount of time. They would be able to handle around 15-20 topics of math's and reasoning and 50 rules of parts of speech.
2. Present themselves with finesse by using around 25-20 idioms and phrases relevant to corporate communication as well as spoken English. They will also learn 50-60 words and other words that are specifically used in meetings, group discussions, presentation and other corporate events.
3. Process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 500-750 words for essay writing along with limited words for technical writing and report writing.
4. Identify themselves in terms of their strengths. Weaknesses and opportunities available to them for the career growth. They would also learn to overcome their weakness and convert into strengths and also make utilization of the opportunity vis-à-vis their strength. They would also learn to set realistic short/long term goals relevant to them through the SMART goal mnemonic.
5. Differentiate between the different types of leaders and groom themselves to be potential leaders. Based on their qualities and strengths they would learn 5 types of leadership styles and mould themselves according to that. They would also learn 10-15 leadership traits.
6. Prepare PowerPoint presentation and paper presentation effectively by focusing on body language, tone of communication and audiences' needs. They would also learn to handle the questions in an effective and smart way.

Unit I **(18 Hours)**

Aptitude (Maths, Logical Reasoning, English)

- Maths
  - › Enjoy maths + Number system
  - › Number system
  - › Percentage, profit and loss
- Logical Reasoning
  - › Coding, Decoding, Number series,
  - › Blood relation Directions, cubes & dices
- English
  - › Vocabulary-1
  - › Confusing words-1(Homonyms)

Unit II **(06 Hours)**

Essential Grammar - III

- Idioms and phrases
- Usage of Idioms & phrases in daily conversation
- Activities
- Academic word list- Words to be used in business communication

Unit III **(04 Hours)**

Written Communication- II

- Essay writing
- Mnemonics to develop ideas and write essays
- Structure of essays
- Technical writing
- Report writing

Unit IV **(06 Hours)**

SWOT Analysis

- Introduction to SWOT
- Importance to SWOT
- Individual & Organizational SWOT Analysis
- Identifying strengths, weaknesses, threats & opportunities
- Short term goals& Long term goals, Career planning

Unit V **(04 Hours)**

Interpersonal Skills - III

- Introduction to leadership skills
- Importance of leadership skills
- Types of leadership skills
- Are leaders born or made?

Unit VI **(04 Hours)**

Presentation Skills

- Introduction to PowerPoint presentation
- Structure & flow of presentation
- Importance of body language
- Presentation by students-evaluation& feedback by trainers

Text Books

1. APAART: Verbal Ability
2. APAART: Logical Reasoning
3. APAART: Quantitative Aptitude
4. APAART: Speak Well 1 (English Language and Communication)
5. APAART: Speak Well 2 (Soft Skills)

21 : COMPUTER APPLICATIONS IN CIVIL ENGINEERING - II

TEACHING SCHEME	CREDITS ALLOTTED
Theory: --	
Practical: 02 Hours / Week	Termwork : 01 Credit

Course Pre-requisites

The Students should have knowledge of

1. basic building aspects.
2. various building components.
3. various building symbols.

Course Objectives

To make student capable of drawing any kind of Engineering drawing using AutoCAD.

Course Outcomes

The students will be able to

1. draw various Engineering drawing using AutoCAD.
2. draw various elements of a building.
3. draw various elevation and sections of the building.

CIVIL ENGINEERING SCOPE AND APPLICATIONS II

- Introduction.
- Getting Started.
- Learning commands: Draw and Modify Menu.
- Learning commands through drawings.
- Centerline drawings
- Layers / Filters

- Blocks
- Area Command
- Drawing Presentation :Sheet size and Text Format

Term Work

1) Introduction to the software: Tool bars, Symbols and Various Commands.
2) Drawing Plates (minimum 10 in number)
3) Drawing Plan, Elevation and Section of G+1 Building.

Text Books

AutoCAD users Guide

22 : TESTING OF MATERIALS

TEACHING SCHEME
Practical: 02 Hours / Week

CREDITS ALLOTTED
Termwork : 01 Credit

Course Pre-requisites

The Students should have knowledge of

1. Engineering Mechanics

Course Objectives

To make student capable to test quality of the materials.

Course Outcomes

The student should be able to decide quality of materials by performing tests on -

1. Metals
2. Cement
3. Aggregate
4. Concrete

Course Contents

The term work shall consist of minimum TWELVE experiments from list below.

Metal: (min Four)

1 Tension Test – Mild steel, Tor steel

2 Torsion test- Mild Steel

3 Direct Shear test- Mild Steel

4 Izod & Charpy Impact test- Mild Steel, Aluminum, Brass, Copper

5 Rockwell Hardness test- Mild Steel, Aluminum, Brass, Copper

Cement: (min Two)

6 Standard consistency and Setting time test on cement

7 Fineness test on Cement

8 Compressive strength of Cement

9 Soundness test on Cement

Aggregate: (min Two)

10 Specific gravity of Aggregates

11 Fineness Modulus of Aggregate

12 Aggregate Impact Value

13 Aggregate Crushing Value

Concrete (min Four)

14 Workability of Concrete & effect of admixture.

15 Compressive strength of Concrete

16 Flexural Test of Concrete

17 Split Tensile strength of Concrete

18 Non Destructive Test on concrete –Schmidth's Rebound hammer test

19 Bending test – Timber

20 Compressive Strength test- Bricks

23 : ENGINEERING MATHEMATICS – III

Teaching Scheme
Lectures: 4 hrs./week

Credits Allotted
Theory : 04 credits

Course Prerequisite

Students should have basic knowledge of:

1. Differential calculus
2. Integral calculus
3. Basics of statistics
4. Basics of Probability

Course Objective

To develop ability to use the mathematical and statistical techniques, skills, and tools necessary for engineering practice.

Course Outcome

- To develop ability to understand mathematical modeling of systems using differential equations and ability to solve the differential equations.
- To develop ability to use the concept of Vector differentiation and integration that finds applications in solid mechanics, fluid flow, heat problems and potential theory etc.
- To develop an ability to analyze the numerical data by applying statistical methods.
- To develop an ability to solve system of linear equation and ordinary differential equation by numerical methods.
- To develop an ability to understand mathematical modeling of systems using partial differential equations and ability to solve the partial differential equations

Unit I **(08 Hours)**

Linear Differential Equations (LDE)

Solution of n^{th} order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's Differential Equitation, Solution of Simultaneous & Symmetric Simultaneous Differential Equitation.

Unit II **(08 Hours)**

Applications of Differential Equitation (DE)

Modeling of problems on bending of beams, whirling of shafts and mass spring systems. Solution of Partial Differential Equations (PDE): by separating variables only.

1) $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$,

2) $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$,

3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

Applications of PDE to problems of Civil and allied engineering.

Unit III **(08 Hours)**

Numerical Methods

Numerical solutions of (i) System of Linear Equations by Gauss Elimination, Cholesky and Gauss-Seidel methods (ii) Ordinary Differential Equations by Euler's, Modified Euler's,

Runge-Kutta 4^{th} order and Predictor-Corrector methods.

Unit IV **(08 Hours)**

Statistics and Probability

Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates.

Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial,Poisson, Normal and Hypergometric; Test of Hypothesis: Chi-Square test.

Unit V **(08 Hours)**

Vector Differential Calculus

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities

Unit VI **(08 Hours)**

Vector Integral Calculus

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equations.

Assignments

1. Linear differential equation with constants coefficients.
2. Application of LDE and partial differential equations.
3. Numerical methods to solve system of algebraic equation and ordinary differential equation.
4. Statistical methods and probability distribution.
5. Vector identities and application of vector differential in mechanics.
6. line integral, surface integral and volume integral.
7. Collect and Solve recent 3 Qustion Papers of BVU.

Text Books

1. Peter V. O'Neil Advanced Engineering Mathematics (Cengage Learning).
2. Erwin Kreyszig Advanced Engineering Mathematics (Wiley Eastern Ltd.)

Reference Books

1. B.V. Raman, Engineering Mathematics by (Tata McGraw-Hill).
2. M. D. Greenberg, Advanced Engineering Mathematics, 2e, by (Pearson Education).
3. Wylie C.R. & Barrett L.C., Advanced Engineering Mathematics, (McGraw-Hill, Inc.)
4. B. S. Grewal, Higher Engineering Mathematics (Khanna Publication, Delhi).
5. P. N. Wartikar & J. N. Wartikar, Applied Mathematics (Volumes I and II) (Pune Vidyarthi Griha Prakashan, Pune).
6. Thomas L. Harman, James Dabney and Norman Richert Advanced Engineering Mathematics with MATLAB, 2e, (Brooks/Cole, Thomson Learning).

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

24 : SURVEYING

TEACHING SCHEME

Theory : 3 Hrs/ Week

Practical : 4 Hrs/ Week

CREDITS ALLOTED

Theory : 03 Credits

Theory : 02 Credit

Course Pre-requisites

The Student Should have knowledge of

1. Basic concept of civil engineering.
2. Basics of mathematics and Geometry.

Course Objective

To make students understand use of various instruments and process of surveying and levelling.

Course Outcomes

The student will be able to

1. Explain the use of linear measurements and prismatic compass in surveying.
2. Describe the process of vertical measurements and contouring and calculate reduced levels.
3. Describe the use of vernier theodolite for angular measurements and calculate coordinates of traverse stations.
4. Calculate omitted measurements in traverse survey and describe permanent adjustments of theodolite.
5. Explain various methods of setting out curves and describe field procedure of curve setting.
6. Explain use of plane table and minor instruments in surveying.

UNIT - I **(06 Hours)**

Linear measurement and Compass survey

Introduction to land surveying, linear measurements, Tapes and EDM-Construction, working and principle, Direct and Indirect methods of linear measurement and ranging, types of tapes, , locating details with offsets by swinging tape, open cross staff and laser square method, concept of scale, R.F. maps and plan. Study and use of topo sheets.

Compass survey: Types of bearing and meridian other than magnetic meridian, local attraction and correction of local attraction, dip, declination, reduction of true bearings, adjustment of closing error.

UNIT - II **(06 Hours)**

Vertical measurements and contouring.

Instruments for vertical measurement-dumpy level, auto level, laser level and digital level. Principle axes of dumpy level, temporary and permanent adjustment, simple, compound and reciprocal levelling, curvature and refraction corrections, distance to the visible horizon.

Contouring: Direct and indirect methods of contouring, uses of contour maps, profile levelling and cross sectioning and their applications, reduction of volume from contour map and tracing grade contour.

UNIT - III **(06 Hours)**

Theodolite and traversing

Study of Vernier transit 20” Theodolite, introduction to digital Theodolite, use of Theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles and magnetic bearing, prolonging a line, lining in and setting out an angle with a Theodolite, plane trigonometrical levelling.

Theodolite traversing: computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch’s rule, Gales traverse table.

UNIT - IV **(06 Hours)**

Omitted measurements, permanent adjustments of transit

Theodolite and Tachometry.

Omitted measurements, area calculation by independent co-ordinates, open traverse and its uses, measurement of deflection angles using transit Theodolite, open traverse survey and checks in open traverse.

Fundamental axes of Theodolite: testing and permanent adjustment of Theodolite

Tachometry: applications and limitations, principle of stadia tachometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points.

UNIT - V **(06 Hours)**

Curves

Introduction to horizontal and vertical curves, different types and their applications, simple circular curves, elements and setting out by linear methods, offsets from long chord and offsets from chord produced, angular method, Rankin's method of deflection angle.

Transition curves: necessity, types and requirements.

UNIT - VI **(06 Hours)**

Plane table survey and construction survey.

Equipments required for plane table survey and their uses, methods of plane table survey: radiation, intersection, traversing, and simple resection, errors and precisions in plane table surveying, construction survey- survey for tunnels, drainage line of buildings, and roads. Use of laser based electronic range finder.

Term work

The term work shall consist of Field book containing record of all exercises and project listed below.

a) Road project showing L-section, plan of road with contours and typical cross section 2-sheets

b) Theodolite traverse survey project. 1-sheets

List of Practical

Details of practicals to be performed, Exercise projects and assignments

1. Linear measurements with tape and accessories.
2. Study and use of auto level and double check leveling.
3. Compound leveling and fly leveling, calculation by rise and fall method.
4. Two peg test for level.
5. Study and use of 20” Vernier Theodolite.
6. Measurement of horizontal angles of triangle by repetition method and applying check.
7. Measurement of vertical angle by transit Theodolite
8. Trigonmetrical levelling by transit Theodolite.

   Project I Road project of minimum length of 250 M including fixing of alignment, profile leveling and cross sectioning.

   Project II Theodolite traverse survey of closed traverse for minimum 0.5 hectares area including building roads etc.
9. Computation of horizontal distance and elevation of points by tachometry for horizontal and inclined sights.
10. Introduction and study of outfit of plane table and method of radiation.
11. Intersection method of plane table survey.
12. Closed plane table traverse survey around a small four sided building.
13. Setting out simple circular curve by Rankine’s method of deflection angle
14. Use of laser based electronic range finder.

Assignments

1 Computation of corrected bearings of the traverse by different methods.

2 Solving problems on calculation of reduced levels by different methods.

3 Preparing contour map of the area from the given spot levels.
4 Study of topographical sheets to record various details shown.
5 Solving problems on trigonometrical leveling.
6 Computations of independent coordinates of a closed traverse.
7 Solving problems on omitted measurements.
8 Calculation of reduced level and distance of a point by tacheometry.
9 Computation of data required to set out the simple circular curve by Rankine's method .
10 Write details of survey for drainage line with proper sketches.

Text Book

1 Surveying and Levelling by Vol. I & II-T.P. Kanetkar and S.V. Kulkarni.
2 Surveying Vol. I & II by Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain.
3 Surveying for Engineers- John Uren & Bill Price- Palgrave Macmillan
4 Plane Surveying A.M. Chandra New age International Publishers
5 Surveying and Levelling N. N. Basak, Tata Mc-Graw hill
6 Surveying Vol. I & II Dr. K. R. Arora.

Reference Books

1 Surveying: Theory and practice---James M. Anderson, Edward M. Mikhail
2 Surveying theory and practices---Devise R. E., Foot F.S.
3 Plane and Geodetic Surveying for Engineers. Vol. I—David clark.
4 Principles of Surveying. Vol. I by J.G. Olliver, J.Clendinning
5 Surveying Vol. I & II by S.K.Duggal, Tata Mc-Graw Hill.
6 Surveying and Levelling by Subramanian, Oxford University Press.

Syllabus for Unit Test.

Unit Test I	Units I, II, III
Unit Test II	Units IV, V, VI

25 : MECHANICS OF FLUIDS

TEACHING SCHEME:
Theory : 3 Hrs/ Week
Practical : 2 Hr/ Week

CREDITS ALLOTED:
Theory : 03 Credits
Termwork : 01 Credit

Course Pre-requisites:

The Student Should have knowledge of

1 Concepts of units and conversion of units
2 Mathematics
3 Physics

Course Objective

To make student understand the scope and application of Mechanics of Fluids.

Course Outcomes

The students will be able to

1 describe basic properties of fluids and measure its properties in static conditions.
2 apply knowledge of fluid kinematics and dynamics conditions.
3 analyze physical phenomenon dimensionally.
4 explain laminar flow and flow through pipes
5 explain of boundary layer theory.
6 describe turbulent flow.

Unit -I (06 Hours)

Properties of Fluids & Statics:

Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids.

Statics: Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height.

Unit II (06 Hours)

Kinematics

Types of flow, path lines and streak lines, stream lines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net.

Unit III (06 Hours)

Kinetics

Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, , Impulse momentum equation.

Unit IV (06 Hours)

Dimensional Analysis and Model Studies

Dimensional homogeneity, Important dimensionless parameters, Dimensional analysis using Buckingham's π theorem, Model studies, Similitude, Model laws, Types of models.

Unit V (06 Hours)

Fundamental of Pipe Flow &Boundary layer theory

Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe ,Hagen Poisullies Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of boundary layer, Boundary layer thickness, Velocity distributions within boundary layer

Unit VI (06 Hours)

Turbulent flow& Pipe Flow Problems

Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Pipe network Analysis, Siphons, Hydraulic transmission through pipes, three reservoir problems.

Term work shall consist of ANY Eight Experiments

Term Work

1. Measurement of Viscosity
2. Study of Pressure Measuring Devices
3. Stability of Floating Bodies
4. Verification of Bernoulli's Theorem
5. Calibration of Venturimeter
6. Calibration of Orifice
7. Calibration of Notch
8. Study of Laminar flow Using Heleshaw'sApparatus
9. Study of Laminar flow Using Reynold's Apparatus

Assignments

1 solution of Numerical Problems asked in recent three years of BVU question papers

2 solution of Questions asked in recent three years BVU question papers

3 report on new topic being discussed in reputed research journals related to fluid mechanics

4 mini Projects such as collection of information, Brochure, Data on a topic related to fluid mechanics

5 writing of industrial Application of Various Topics of Syllabus

6 design of New Experiments related to fluid mechanics

7 collection of two fluid mechanics NPTEL videos and demonstration of it.

8 collection of information, brochure of new equipments / machinery / materials related to fluid mechanics.

9 collection of information about fluid mechanics phenomenon and its explanation.

10 collection of data of different fluids with reference to their properties.

Text Books/ References :

1. Garde R. J. and Mirajgaonkar "Engineering Fluid Mechanics" ScitechPulication
2. Garde R. J. and Mirajgaonkar "Fluid Mechanics Through Problems" , New Age International New Delhi
3. Modi P.N. and Seth S.M. " Fluid Mechanics" Standard Book House
4. Streeter- Wylie,"Fluid Mechanics", TataMcGraw Hill Publication

Syllabus for Unit Test

Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

26 : CONSTRUCTION TECHNIQUES & MACHINERY

TEACHING SCHEME
Theory: 03 Hours / Week

CREDITS ALLOTTED
Theory : 03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Building Construction Practices, Building Planning & Design.
2. Engineering Economics.
3. Concrete Technology.

Course Objectives

Students should get knowledge of Construction Operation Equipments & different methods of advanced construction techniques, tunneling, concreting & dewatering.

Course Outcomes

Student will be able to

1. explain erection techniques for high rise structures.
2. describe different construction techniques in underwater construction.
3. explain advanced construction techniques.
4. describe different Earth moving equipments.
5. explain hoisting & hauling equipments.
6. describe various dewatering & paving equipments.

UNIT - I (06 Hours)
CONSTRUCTION MECHANISATION & HIGH RISE CONSTRUCTIONS

Role of Construction activity in the National (including Urban & Rural) & Global development. Necessity of mechanization in construction industry. Types of construction such as Light, Medium & Heavy duty. Erection techniques for high rise structures, advantages & disadvantages of high rise structures. Scope of infrastructure in India and provisions made.

UNIT - II (06 Hours)

UNDER WATER CONSTRUCTION

Cofferdams & Caissons – Definition, Classification & its use. Dredging Techniques. Construction under deep water (Tremie Method). Classification & different types of Piles, Sheet Piles, Pile driving techniques, Negative skin friction. Use of special types of Formwork. Jetties.

UNIT - III (06 Hours)

ADVANCED CONSTRUCTION TECHNIQUES

Launching of Girders, Precast Techniques, Tunnel Driving techniques, Tunnel boring machines (Open & Shield), Road Headers & Boomers, Placing of concrete in Hot & Cold weather conditions. Shotcreting & Gunieting. Trenchless Technology, Micro Tunneling. Pneumatic Drilling equipments. Drill & Blast method.

UNIT - IV (06 Hours)

EARTH WORK MACHINERIES

Classification of Earth Moving machines (rippers, dragline, scrappers, pavers, backhoe) & factors affecting in selection. Group behavior of equipments. Manpower requirement for the equipments. Rollers, Tractors, Bull Dozers, Rippers, Draglines & Clamp Shells, Scrappers, Dumpers, Pavers, Power Shovels, Backhoe -: detailed study of these equipments with classification, uses, output, & economics. Excavating, Transporting & compaction equipments. Importance of record keeping of machineries & mode of payment for them.

UNIT - V (06 Hours)

HOISTING & CONVEYING EQUIPMENTS

Hoisting & Transporting equipment; types (Derrick, Tower & Mobile), factors affecting for selection. Conveying equipments-: belt, apron, vibrating, pneumatic, flight & spiral or screw conveyors. Hauling equipments. Crushers & its types.

UNIT - VI (06 Hours)

DEWATERING, PAVING EQUIPMENTS & CONCRETE PUMPS

Dewatering Techniques; Electro-osmosis method, Well Point System. Paving

Equipments; Types, Uses. Asphalt Pavers, Slip Form Pavers, Concrete Pavers. Pumps; Types & Uses. Pumps for concreting.

Assignments :

1. Errection Technique for high rise structures.
2. Pile driving techniques.
3. Tunnel driving shotereting and guniting.
4. Study of different types of earth work machinaries.
   (Case study of any two equipment)
5. Case study of hoising and transporting equipment
6. Dewatering techniques, poving equipments.
7. Presentation on any one topic from above units.

Textbooks / Reference Books

1) Mahesh Verma, "Construction Equipment & Planning & Application", Metropolitan Book Company Private Ltd., New Delhi.
2) Peurifoy Robert L., William B. Ledbetter, "Construction Planning Equipment Methods", Mc Graw Hill Book Company.
3) Russel James E., "Construction Equipment", Reston Publishing Company.
4) Shetty M.S., "Concrete Technology – Theory & Practice", S. Chand & Company Private Limited.
5) S.C. Sharma & Khanna, Construction Equipments & its Management",
6) V.R. Phadke "Construction Machinery & Works Management".

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

27 : STRUCTURAL ANALYSIS - I

TEACHING SCHEME
Theory: 03 Hours / Week

CREDITS ALLOTTED
Theory : 03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Solid Mechanics

Course Objectives

To make student capable to analyse the structure.

Course Outcomes

The student should be able to

1 Calculate degree of indeterminacy of the structure.
2 Calculate deflection of truss.
3 Analyse Indeterminate truss using strain energy method.
4 Calculate fixed end moments.
5 Analyse plane structure using slope deflection method.
6 Analyse plane structure using moment distribution method.

UNIT - I (06 Hours)

Basic Concepts

Types and classification of skeletal structures, members, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beams and frames.

Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axial force, shear force, bending moment and torsional moment.

UNIT - II (06 Hours)

Deflection of Beam and Truss

Deflection of determinate beam using conjugate beam method, Deflection of joints of determinate truss using Castigliano's first theorem

UNIT - III (06 Hours)

Analysis of Indeterminate Plane Trusses using Castigliano's theorem

Analysis of indeterminate trusses by application of Castigliano's second theorem; Effect of lack of fit, temperature changes in member and Sinking of supports.

UNIT - IV (06 Hours)

Fixed Beams and Three Moment Theorem

Analysis of propped cantilevers and fixed Beams; Sinking of support. Analysis of indeterminate beam using clapeyron's three moments theorem.

UNIT - V (08 Hours)

Slope Deflection Method

Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of non- sway and sway rectangular portal frames (with indeterminacy up to 3 degrees);

UNIT - VI (08 Hours)

Moment Distribution Method

Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of non-sway and sway rectangular portal frames (with indeterminacy up to 3 degrees).

Assignments :

1. Draw different types of structures - space, plane, trusses, beams and frames.
2. Draw deflected shapes of different types of structures.

3. Calculate degree of static indeterminacy.
4. Calculate degree of kinematic indeterminacy.
5. Calculate deflection of beam using conjugate beam method
6. Calculate deflection of truss using Castigliano's first theorem.
7. Analysis of indeterminate trusses using Castigliano's second theorem
8. Write fixed end moments for different loading cases.
9. Explain three moment theorem
10. Analysis of beam/frame using slope deflection method.
11. Calculate distribution factor at joint.
12. Analysis of non-sway beam/fram using moment distribution method.
13. Analysis of sway frame using moment distribution method.

Text Books

1) Hibbeler R. C., "Structural Analysis", Prentice Hall Publication
2) Pandit G. S. & Gupta S. P., "Theory of Structures Vol-I", Tata McGraw Hill Publication
3) Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company

Reference Books

1) Prakash Rao D. S., "Structural Analysis", Universities Press Publication
2) Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication
3) Aslam Kassimali, "Structural Analysis", Cengage Learning.

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

28 : PROFESSIONAL SKILLS DEVELOPMENT IV

TEACHING SCHEME	CREDITS ALLOTED
Theory: 4 Hours / Week	Theory : 4 Credits

Course Pre-requisites

The Students should have knowledge of

1. Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. An overall idea about the difference in personal and professional communication in terms of vocabulary used.
3. Knowledge of writing skills, importance of professionalism in emails and letters.
4. They should be aware of concepts of self esteem, self-assessment and its importance in setting long term and short term goals.
5. Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6. Body language and importance of non verbal communication to maintain professionalism.

Course Objectives

The Professional Skills Development 4 is an extension of PSD- 3 with focus on the remaining topics of Maths and Logical reasoning. The further complex concepts of Aptitude and Grammat aims to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-4 focuses on the higher aspects of soft skills such as grooming them on corporate etiquettes and various formats of email/ letter writing so that can present themselves as professionals further both in oral and written communication.

Course Outcomes

The student should be able to

1. Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar relevant from the recruitment point of view.
2. Use appropriate words in the right context both academically and professionally. Students would have approximately around 80-100 words from the academic word list prescribed in the syllabus.
3. Understand the importance of email etiquettes and distinguish between the format of formal and informal emails/letters. They would be able to draft professional mails and letters like job application letters, cover letters, and apology emails with proper structure and words which are necessary in the corporate life.
4. Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5. Understand the major concepts of leadership like coaching, mentoring. They would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life.
6. Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector. They would also learn various strategies and conversational techniques to handle telephonic interviews confidently.

Unit I (18Hours)

Aptitude (Maths, Logical Reasoning, English)

- Maths
    - Simple Interest and Compound Interest

- Ratio, Proportion and Average
    - Mixture and Allegation
- Logical Reasoning
    - Data Interpretation
    - Data Sufficiency
- English
    - Grammar I
    - Vocabulary - Analogies

Unit II (4 Hours)

Essential Grammar - IV

- Vocabulary – Academic word List

Unit III (6 Hours)

Written Communication- III

- Email writing and etiquettes – formal and informal email writing, format of various types of email, do's and don'ts of email writing
- Letter writing – formal letters, job application letter, cover letter.
- Essay writing – mnemonics top develop ideas and write essays, structure of essays

Unit IV (4 Hours)

Self Awareness and Conflict Resolution

- Self-assessment & Perception & attitudes.
- Analyzing skills & weaknesses and habits.
- Developing positive attitude & handling criticism positively
- Handling conflicts in the personal and corporate sector
- Causes of conflicts in work scenario.
- Ways and methods for conflict resolution

Unit V (6 Hours)

Interpersonal Skills - III

- Mentoring, Difference between Leadership and Management
- Leading with examples
- Time management -The Time Management Matrix, Pareto Principle

Unit VI (4 Hours)

Corporate Etiquettes and Grooming

- Introduction to grooming & etiquettes
- Ways of handling telephonic interviews

Text Books

1. APAART: Verbal Ability
2. APAART: Logical Reasoning
3. APAART: Quantitative Aptitude
4. APAART: Speak Well 1 (English Language and Communication)
5. APAART: Speak Well 2 (Soft Skills)

29 : COMPUTER APPLICATIONS IN CIVIL ENGINEERING - III

TEACHING SCHEME	**CREDITS ALLOTTED**
Theory: --	
Practical: 02 Hours / Week	Theory : 01 Credit

Course Pre-requisites

The Students should have knowledge of

1. structural elements.
2. various forces acting on the structure.
3. analysis of the results obtained from the software

Course Objectives

To make student capable of analysis various different structures.

Course Outcomes:

The students will be able to

1. model different types of structures.
2. assign different types of load and supports to the structural members.
3. Analyze the structure and extract the output results.

- Introduction.
- Getting Started.
- Modeling of geometry.
- Application of loads, supports and sections
- Analyzing the structure.
- Extracting the output results: Maximum stresses, Maximum strains, SFD and BMD, Deflection values.

Term Work:

1) Assignments on analysis of Beams.
2) Assignments on analysis of Frames.
3) Assignments on analysis of Trusses.
4) Project.

Text Books:

Staad. Pro Manual

30 : CIVIL ENGINEERING CONSTRUCTION PRACTICE

TEACHING SCHEME
Practical: 02Hours /Week

CREDITS ALLOTTED
Termwork : 01Credits

Course Pre-requisites

The Student Should have knowledge of

1. Basic concept of Civil Engineering.
2. Basics of mathematics.

Course Objective

1. To make students understand Civil Engineering Practices.

Course Outcomes

Student will be able to

1. setout of foundation for buildings.
2. carry out testing of construction materials
3. manage inventory on site.
4. maintain quality control on site.
5. work as a site engineer

List of Practicals

1. Setting out and layout of building foundation.
2. Study of various types of drawings required on construction sites
3. Study of reinforcement and its bending for different structural members.
4. Slump test on concrete and effect of plasticizers.
5. Study of formwork & scaffolding.
6. Construction of different types of brick masonry bonds, study of recent types of bricks and blocks

7. Study of plastering & pointing.
8. Study of different types of tiles.
9. Introduction to water supply & sanitary fittings and appliances.
10. Consealed construction practices.
11. Types of paints.
12. Methods of Waterproofing of toilets & roofs.
13. Testing of concrete cubes of different grades.
14. Study of stock register format and daily report.

REFERENCES

1. A to Z Building Construction by Mantri publication.
2. My Construction Practices by R.B. Chaphalkar.
3. Building construction by B.C.Punmia.
4. Building construction by S.P. Arora & S. P. Bindra

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standards of Passing and ATKT Rules

1. For all courses, both UE (Universtiy Evaluation) and IA (Internal Assessment) constitue separate heads - of - passing (HoP). In ordar to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0 (40 % Marks) at UE and also a minimum grade point of 5.0 (40 % Marks) at IA.

OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50% Aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fail at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

1. A student is allowed to carry backlog of courses prescribed for B.Tech Sem - I, III, V, VII to B.Tech Sem - II, IV, VI, VIII respectively.
2. A student is allowed to keep term of Sem - III, if he/she is failing in any number of subjects of Sem I & II.
3. A student is allowed to keep term of Sem - V, if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem - I & II.
4. A student is allowed to keep term of Sem - VII, if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem - III & IV.

Award of Class for the Degree Considering CGPA

Award of Honours

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq CGPA \leq 10.00$	0	Outstanding	$80 \leq Marks \leq 100$
$9.00 \leq CGPA \leq 9.49$	A+	Excellent	$70 \leq Marks \leq 80$
$8.00 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks \leq 70$
$7.00 \leq CGPA \leq 7.99$	B+	Good	$55 \leq Marks \leq 60$
$6.00 \leq CGPA \leq 6.99$	B	Average	$50 \leq Marks \leq 55$
$5.00 \leq CGPA \leq 5.99$	C	Satisfactory	$40 \leq Marks \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

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BHARATI VIDYAPEETH DEEMED UNIVERSITY
Pune.

Faculty of Engineering & Technology
Programme : B. Tech. (Civil)

COURSE STRUCTURE AND SYLLABUS
(Choice Based Credit System - 2014 Course)

B. Tech. (Civil) (Sem V & VI)

Vision :

Provide high quality technical manpower to the industry and nation.

Mission :

Social Transformation Through Dynamic Education

Goals :

a) To create work place environment that attracts and retains superior and diversified faculty members.

b) To adopt policies to promote faculty development programmes.

c) To gather, support and collaboration for research activities in emerging technologies and interdisciplinary studies.

d) Constant reform and upgradation of curricula to keep pace with rapidly advancing technology trends.

e) Development of centre of excellence in Engineering and Technology.

f) Strengthen the interaction with R & D and industry organizations.

g) Accelerate the process of sharing knowledge, infrastructure and resources for better tomorrow.

h) Enhance the facilities necessary for training, testing and consultancy services.

BHARATI VIDYAPEETH UNIVERSITY
Pune

Faculty of Engineering & Technology
Programme : B. Tech. (Civil)

COURSE STRUCTURE AND SYLLABUS
(Choice Based Credit System - 2014 Course)
B. Tech. (Civil) (Sem V & VI)

Bharati Vidyapeeth Deemed University

Bharati Vidyapeeth, the parent organization of this University is one of the largest educational organizations in the country. It has 171 educational units under its umbrella including 67 Colleges and Institutes of conventional and professional education.

The Department of Human Resource Development, Government of India on the recommendations of the University Grants Commission accorded the status of "Deemed to be University" initially to a cluster of 12 units of Bharati Vidyapeeth. Subsequently, 17 additional colleges / institutes were brought within the ambit of Bharati Vidyapeeth Deemed University wide various notifications of the Government of India. Bharati Vidyapeeth Deemed University commenced its functioning on 26th April, 1996.

Constituent Units of Bharati Vidyapeeth Deemed University

1. BVDU Medical College, Pune.
2. BVDU Dental College & Hospital, Pune
3. BVDU College of Ayurved, Pune
4. BVDU Homoeopathic Medical College, Pune
5. BVDU College of Nursing, Pune
6. BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
7. BVDU New Law College, Pune
8. BVDU Social Sciences Centre (M.S.W.), Pune
9. BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
10. BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
11. BVDU College of Physical Education, Pune.
12. BVDU Institute of Environment Education & Research, Pune
13. BVDU Institute of Management & Entrepreneurship Development, Pune
14. BVDU Poona College of Pharmacy, Pune
15. BVDU College of Engineering, Pune
16. BVDU Interactive Research School in Health Affairs (IRSHA), Pune
17. BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
18. BVDU College of Architecture, Pune
19. BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
20. BVDU Institute of Management, Kolhapur
21. BVDU Institute of Management & Rural Development administration, Sangli
22. BVDU Institute of Management & Research, New Delhi
23. BVDU Institute of Hotel Management & Catering Technology, Pune

24. BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
25. BVDU Medical College & Hospital, Sangli
26. BVDU Dental College & Hospital, Mumbai
27. BVDU Dental College & Hospital, Sangli
28. BVDU College of Nursing, Sangli
29. BVDU College of Nursing, Navi Mumbai

The status of University was given to a cluster of these colleges and institutes in appreciation of the high level of their academic excellence and for their potential for further growth.

During the last 20 years or so, the University has achieved higher pinnacles of academic excellence and has established its reputation to such an extent that it attracts students not only from various parts of India but also from abroad. According to a survey conducted by Association of Indian Universities, this University is one among the top ten Universities in the country preferred by the overseas students for admissions. At present, there are more than 850 overseas students from 47 countries on the rolls of constituent units of this University.

During the last 20 years, there has been tremendous academic expansion of the University. It now conducts in all 305 courses in its constituent units, of them 108 are Post Graduate, 45 are Under Graduate and 55 Diploma level courses, 12 Fellowship and 5 certificate courses. All the professional courses which the University conducts such as those of Medicine, Dentistry, Engineering etc., have approval of the respective statutory councils, viz., Medical Council of India, Dental Council of India, All India Council for Technical Education etc.

The University is a throbbing center of research activities and has launched Ph.D. programmes in 77 subjects and M.Phil in 3 subjects. It has also introduced quite few innovative academic programmes such as Masters in Clinical Optometry, M.Tech. in Nano Technology etc.

The University's performance and achievements were assessed by the "National Assessment and Accreditation Council" and it was reaccredited with a prestigious "A" grade in 2011. Some programmes of the constituent units such as College of Engineering at Pune, Management Institute in Delhi and others have also been accredited by "National Board of Accreditation". Three constituent units of Bharati Vidyapeeth Deemed University are also the recipients of ISO 9001-2001 certifications.

College Information :

Bharati Vidyapeeth University College of Engineering, Pune (BVUCOE) established in 1983, a constituent unit of BVU (University with 'A' Grade status by MHRD, accredited to Grade 'A' by NAAC in 2004 and 2011) and holds a place of pride and is amongst the most reputed institute. It has been ranked to 61st by National Institutional Ranking Framework (NIRF) with criteriawise ranking as 5th in Graduate Outcome (GO), 13th in Outreach and Inclusivity (OI), 44th in Teaching Learning Resources (TLR) and 62nd in Perception (PR). This also made institute to stand 4th in the State of Maharashtra. Further, DATAQUEST-CMR national survey also ranked this institute to 4th among private technical institutions of India, 29th by Times of India and 41st by OUTLOOK. This is the only institute selected by MHRD for its Technical Education Quality Improvement Programme (TEQIP-II – 1.1 Programme) for the grant of Rs. 4 Crores.

BVUCOE, Pune offers 09 graduate, 08 post graduates programmes and Doctoral programmes in 08 disciplines. All Programmes are accredited by National Board of Accreditation (NBA) twice and we have applied for third cycle of accreditation.

Institute has its own spacious well designed building measuring 26,286 sq. m. and it houses 101 labs, 43 class rooms, and 21 tutorial rooms. The library of the institute is a five storied building and houses periodical section, computer center, reading hall, reference section. It contents more than 60,000 books, 15,000 volumes, 80 national and 81 international journals subscription and digital library facility. Digital library of institute with 66,944 number of journals in e-form is one of the richest source of knowledge in e-form for students and faculty members. The Library, Laboratories, Equipments, Learning resources and Software constantly get upgraded and updated in tune with the changing time. An Investment of Rs.119.95 million is made in the last five years.

The structured faculty development programme has strengthened quality of Teaching - Learning Process in the institute. 35 faculty members with Ph. D. qualifications have been proved as resources for research, innovations and sound Teaching – Learning Process. As a part of quality improvement programme 04 number faculty members were deputed to International Universities, Institutions of national importance such as IIT, NIT etc. for qualification improvement. Team of 206 faculty members with average experience 11.7 years and average age 38.3 years indicates teachers with fine blend of experience and youth. Faculty members are well conversant and trained for use of latest softwares and latest equipments being purchased every year as policy of upgrading laboratories. In last five years college has invested Rs. 119.95 million in laboratory upgradation. Institute organized 138 number of continuing education programmes in last five years to keep sharpen skills of faculty members. Further, 1389 faculty members were deputed to attend various workshops and training programmes for sharing and enhancing their knowledge. Faculty members also play active role in curriculum development as Member of Board of Studies of various subjects and other statutory bodies of the University.

The research quality is indicative of the university penchant for quality. The research publications in reputed international and national refereed journals and conferences have shown a steady and significant rise over the years which is aptly reflected by 1091 Research papers publications in reputed national and international journals in last five years. Grant

of Rs. 152.73 Lakhs from funding agencies such as UGC, DST, DRDO, AICTE etc. fetched by faculty members is strong indicator of research aptitude of faculty members. Seed money up to Rs. 3 lakhs under Institutionally Funded Research Programme (IFRP) nurtures research aptitude of faculty members. 575 number of publications in standard research databases such as SCOPUS, Web of Science, Google Scholar etc. in last five years throws light on quality of publications by faculty members of this institute. These publications by faculty members have received 137 number of citations in the same period. Institute has 02 patents to its credit and filed 05 patents.

The institute has collaboration with international universities such as North Carolina A & T State University, Greensboro, USA, Joint School of Nanoscience and Nanoengineering (JSNN), USA, The University of Tokushima, Japan, ARM University, USA and with industries such as TCS, SKF India Ltd. Every year one faculty member is deputed for Ph. D. programme in NCAT with scholarship. Students of M. Tech. (Nanotechnology) joins JSNN, USA to pursue their dissertation research work for six months with scholarship to the tune of $1000 per month. Further, NCAT, USA, The University of Tokushima, Japan contributes intellectually as well as financially to organize biannual international conference NANOCON. Three editions of NANOCON are conducted since 2010 with their association. In association with Eduvance & GAATsis, a " Center of Excellence in Embedded Systems" is established in the Institute with donation of Educational kits like ARM development boards from ARM University Program and PSoC kits by Cypress Semiconductors are used for developing projects in the sponsored laboratory. TCS supports students and faculty members for faculty enablement programmes and student development programme. Establishment of Lubricant Conditioning Monitoring Laboratory is outcome of collaboration with SKF India Ltd.

Being Deemed University college takes advantage of academic autonomy in making the curriculum industry oriented and enable students to make employable. In-plant training (45 days), courses such as Professional Skill Development introduced as integrated part of course structure. In-plant training enable students to interact within their associated industries for gaining practical field experience and professional exposure. Curriculum is Choice Based Credit System which makes students path of joining international universities for their higher studies smoother.

Today, qualitative soft skill development in students is more pertinent to a student's professional career. The institute regularly arranges training programme in the area of personality development, aptitude test, group discussion and personal interview. Through its Employment Enhancement Programme (EEP) designed for third year students which comprises of communication skill quantities analysis, corporate culture, IT Training and soft skills. This programme is conducted in association with professional institutes of national repute for effective execution and implementation. To enhance their professional experience and get them head start in the industry, an innovative programme is initiated on student mentoring "Saturday @ BV", wherein speakers are entrepreneurs and high ranked corporate who share their experiences, hardship and their corporate journey.

In it's long, multi-pronged, persistent and pain staking efforts for producing quality engineering professionals, institute has produced more than 1068 entrepreneurs.

PROGRAMME : CIVIL ENGINEERING

Vision:

To Create Civil Engineers who will transform Civil Engineering Industry for sustainable development of society.

Mission:

Create responsible Civil Engineers to meet global challenges.

Program Education Objectives : PEO

PEO1: To prepare students for career in Civil Engineering profession.

PEO2: To develop a responsible 'Entrepreneur'.

PEO3: To develop the student to cope up with the advancements in Civil Engineering.

Program Outcome : (PO)

The Graduates will be able to

1. apply possessed knowledge of fundamental subjects to civil engineering problems.
2. analyze civil engineering problems.
3. design civil engineering structures with appropriate consideration to safety,economy, health and environmental considerations.
4. solve complex civil engineering problems by conducting investigations.
5. use modern civil engineering tools, techniques and softwares.
6. apply their professional responsibilities.
7. understand the impact of professional engineering solutions in societal and environmental contexts.
8. exhibit professional ethics and norms of engineering practice.
9. function individually and in teamwork.
10. communicate effectively in both verbal and written forms.
11. manage the work and finance of a civil engineering projects.
12. practice the use of lifelong learning.

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
31.	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32.	Advanced Surveying	3	2	--	60	20	10	10	50	--	150	3	1	4
33.	Engineering Project Management	3	2	--	60	20	10	10	50	---	150	3	1	4
34.	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35.	Advance Mechanics of Fluid	3	2	--	60	20	10	10	50	----	150	3	1	4
36.	Professional Skill Development-V	4	--	--	100	--	--	--	--	---	100	4	--	4
	Total	**20**	**08**	**1**	**400**	**100**	**50**	**50**	**200**	**--**	**800**	**21**	**4**	**25**

* End Semester Exam of duration 4 Hrs.

OPTIONAL SUBJECT

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
3.	Engineering Mathematics - IV	4	--	--	60	20	10	10	--	---	100	4	--	4

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
37.	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38.	Environmental Engineering-I	3	2	--	60	20	10	10	--	50	150	3	1	4
39.	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40.	Geotechnical Engineering	3	2	--	60	20	10	10	50	---	150	3	1	4
41.	Elective-I	3	--	--	60	20	10	10	--	----	100	3	--	3
42.	Professional Skill Development-VI	4	-	--	100	--	--	--	--	---	100	4	-	4
	Total	**19**	**08**	**2**	**400**	**100**	**50**	**50**	**150**	**50**	**800**	**21**	**4**	**25**

End Sem Exam of duration 4 hours.

Total Credits

Semester V = 25

Semester VI = 25

Grand Total = 50

List of Elective I Subjects

Sr. No.	41 Elective - I (Sem VI)
41 A	Financial Management
41 B	Advanced Structural Analysis
41 C	Urban Water Management
41 D	Docks, Ports and Harbours
41 E	Human Resource Management
41 F	Green Construction Practices
41 G	Numerical Methods in Civil Engineering.

31 : STRUCTURAL DESIGN-I

TEACHING SCHEME
Theory: 4Hours / Week
Practical: 2Hours / Week
Tutorial : 1 Hour / Week

CREDITS ALLOTTED
Theory : 5 Credits
Termwork : 1 Credit

Course Pre-requisites

The Students should have knowledge of

1. Structural Analysis- I
2. Mechanics of Solids

Course Objectives

To make student capable to design different structural elements using steel.

Course Outcomes

The student will be able to

1. estimate design load
2. design a connection for axial load
3. design a members for axial tension
4. design a members for axial compression
5. design a built up column
6. design a beam

UNIT - I (06 Hours)

Design Philosophy

Types of structural elements and their behavior, Introduction to IS:875, Types of Loads, Estimation of Loads, Wind Load on Roof Truss.Load combinations, Design Load,Steel as a structural material, Type of structural steel, Mechanical Properties, Rolled steel sections and engineering properties, Introduction to SP6(1),Strength of Section, Design strength, Partial safety factors, Concept of Limit state design, Introduction to IS:800.

UNIT - II (06Hours)

Design of Connections for Axial Load

Types of fasteners, advantages and disadvantages, Types of bolts, Design strength of bolts, Design of bolted connection and detailing, Strength of weld, Design of weld and detailing.

UNIT - III (06Hours)

Design of Axially Loaded Tension Members

Behavior of member in tension, Axial tension capacity of plates, single and double angles and channel section, Design of axially loaded Tension members.

UNIT - IV (06 Hours)

Design of Axially Loaded Compression Members

Behavior of member in compression, Concept of Effective Lengths, Axial compression capacity of single and double angle section, Design of axially loaded compression members.

UNIT - V (06 Hours)

Design of Builtup Column and Column Base.

Axial compression capacity of Built up Column, Design of built up column, Design of Lacing system, Design of battening system, Design of slab base, Design of gusseted base.

UNIT - VI (06 Hours)

Design of Beams

Behavior of beams, Shear and moment capacity of Laterally supported and laterally unsupported beam. Design of beam, Design of built up section, Curtailment of plates, Design of bolted connections for shear and moment.

Term Work

The term work shall consist of minimum any ONE projects with 2 numbers of half imperial sheets based on following topics:

1) Design of roof truss: Load estimation, Analysis of truss, Design force for member, Design of Members, Design of connection, Design of Purlin, Drawing.

2) Design of Building: Load estimation, Analysis of frame, Design of Secondary beams, main beams, Columns, Beam to Beam, Beam to Column connections, column bases, etc.

Assignments

1) Calculate Wind load acting on the roof truss.
2) Design of bolted or welded connection for axial load.
3) Design of member for axial tensile load.
4) Calculate axial capacity of member in compression.
5) Design of lacing or battening connection for built up column
6) Calculation of moment and shear capacity of rolled / built up section.
7) Explain limit state design phidosophy.
8) Explain diffrent types of structural sections and their properties.
9) Calculate design strength of given bolt.

Reference Books

1) N. Subhramanian, " Design of Steel Structures", Oxford University Press
2) S. K Duggal, "Limit State Desin of Steel Structures", Tata McGraw-Hill Education
3) S.S.Bhavikatti, "Design of Steel Structures: By Limit State Method", I K International Pub
4) Dr. Ramchandra, "Limit State Design of Steel Structures", Scientific Publishers
5) M. R. Shiyekar, "Limit State Design in Structural Steel", Prentice-Hall of India

6) IS:800-2007, General Construction in Steel - Code of Practice”

7) IS:875-1987, “Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)”

8) IS:808-1989, “Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections”

9) SP-6(6)- 1972, “Handbook for Structural Engineers”

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

32 : ADVANCED SURVEYING

TEACHING SCHEME
Theory: 3Hours / Week
Practical: 2Hours / Week

CREDITS ALLOTTED
Theory: 3 Credits
Termwork:1 Credit

Course Pre-requisites

The Students should have knowledge of

1. Fundamentals of Civil Engineering
2. Surveying

Course Objectives

To make student cabable to use advanced surveying techniques for mapping

Course Outcomes:

The student will be able to

1. explain Geodetic control survey and theory of errors.
2. explain various features of modern Total Station for survey .
3. describe principles and components of Space Based Positioning System and its applications .
4. describe technique of Hydrographic Survey.
5. describe the process of Aerial survey and its use in Surveying.
6. explain basics of Remote sensing and Geographical information System and its applications.

UNIT - I (6Hours)

Geodetic Control Survey

Introduction to geodetic control survey,System- Triangulation and Trilateration,Triangulation stations and figures, concept of base line. Types of errors, Probable error and its determination, Laws of weights, Method of least squares, Normal equation, Adjustment of triangulation figure.

UNIT - II (6Hours)

Total Station Survey

Concept and necessity of an electronic total station instrument. Types of total station as per EDM , range and angle resolution system.Principle features of an ETS, temporary adjustments, On board programmes such as REM, RDM, Free stationing, resectioning etc.,traverse survey with ETS. Concept of data down loading and post processing software, Errors in ETS survey.

UNIT - III (6 Hours)

Space Based Positioning Techniques:

Introduction and concept, segments of SBPS- space,control and user. GNSS type SBPS in action-GPS, GLONASS, Compass. RNSS type SBPS in action-Quasi zenith, IRNSS. GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential. Access denial techniques and ephimeris. SBPS coordinates and heights. Surveying with SBPS. Errors in positioning with SBPS. Applications of SBPS

UNIT - IV (6Hours)

Hydrographic Survey

Concept, objects, Soundings and instruments and personnel required for sounding, methods of locating soundings. Three point problem and its solution by mechanical, analytical and graphical method. Tides and tidal gauges and establishment of MSL

UNIT - V (6Hours)

Photogrammetry

Elements of photogrammetry, types of photogrammetry. Aerial photographs their types and scale. Concept of relief displacement, Stereoscopy, parallax and mirror stereoscope, parallax equation and difference in elevation from differential parallax. Ground control. Procedure of aerial survey and flight planning.

UNIT - VI (6 Hours)

Remote Sensing and Geographic Information System :

Remote sensing-concept, types –active and passive, components of remote sensing system, electromagnetic energy and spectrum, atmospheric windows and spectral signature. Remote sensing platforms and sensors. Remote sensing data products, interpretation of remotely sensed images visual and digital. Limitations and applications of remote sensing.

Concept and need of GIS, Components- people, procedure, hardware, software and data .Functions-Input, manipulation, management, Query analysis and Visualization. Application and limitations of GIS.

Assignments

1. Solution of problems on Laws of weights and normal equations.
2. Collection of information for various types of ETS used and available in the market and their salient features
3. Collection of information of SBPS of various countries and applications of SBPS.
4. Write a report on Instruments used for measurement of soundings.
5. Case studies on applications of Remote sensing in Mappins.
6. Case studies on applications of Aerial survey.
7. Case stude on applications of GIS for Urban Planning.
8. Collection of information for various remote sensing satellite of India.

Term Work

Any Ten Experiments

1. Study and use of one second theodolite and measurement of horizontal angle
2. Measurement of horizontal angles by reiteration method and Measurement of vertical angle.
3. Study and use of total station.

4. Study and use of total station for traverse survey.
5. Applications of Total Station for REM, RDM.
6. Study and Use of Nautical Sextant for measurement of horizontal angles.
7. Study and Use of Mirror stereoscope to find air base distance. parallax bar and determination of difference in elevation by differential parallax
8. Study and use of parallax bar and determination of difference in elevation by differential parallax.
9. Adjustment of braced Geodetic quadrilateral
10. Study and use of Handheld GPS for traverse survey
11. Solution of three point problem inhydrographic surveying
12. Study of GIS software.

Text Books

1. Duggal S. K., “Surveying Vol-1, Vol-2”, Tata Mac Graw Hill pub. co., New Delhi
2. Punmia B. C., “Higher Surveying”, Laxmi Publications, New Delhi
3. Chandra A.M. ,”Higher Surveying “ ,New Age International Publishers,
4. Bannister A. and Raymond Baker , “Surveying” , Pearson Education
5 Anji M. Reddy, “ Text book of Remote Sensing and GIS “, BSP BS Publications

Reference Books

1. Uren J., W. F. Price, “Surveying for Engineers”, Macmillan Pub
2. Wolf P. R., “Elements of Photogrammety”, Mc Graw Hill
3. Agarwal C. S., Garg P. K., “Remote Sensing in Natural Resources”, Wheeler Publishing
4. Lo C.P., Albert Yeung , “ Concepts and techniques of GIS “, Printice Hall of India

Syllabus for Unit Test

Unit Test -1 UNIT – I,II,III

Unit Test -2 UNIT – IV, V ,VI

33 : ENGINEERING PROJECT MANAGEMENT

TEACHING SCHEME		CREDITS ALLOTTED
Theory:	3Hours / Week	Theory -3 Theory
Practical:	2Hours / Week	Termwork -1 Creditz

Course Pre-requisites

The Students should have knowledge of

1. Building construction.
2. Building planning and design.

Course Objectives

To prepare the student to analyze the network and monitor and control the civil engineering projects.

Course Outcomes

The student will be able to

1. prepare organization chart.
2. prepare a network and analyze by CPM and PERT methods.
3. update network and carryout resource allocation
4. carry out material management
5. solve linear programming problem by graphical and simplex methods
6. check quality parameters in construction process.

UNIT - I (06 Hours)

Introduction to Project Management

Importance, Objectives and functions of Management, Categories of Project, Project Life Cycle Concept, Importance of organizational structures, types of organization, Project Manager education, experience, authority & responsibility.

UNIT - II (6 Hours)

Project Planning & Scheduling

Gantt /Bar Charts and its limitations, Network planning, network analysis, C.P.M., P.E.R.T., Types of floats, Slack. Ladder network,

UNIT - III (6 Hours)

Project Monitoring & Control

Resource allocation, resource smoothening and leveling, crashing of network, direct cost and indirect cost, Cost Slope, updating of network,

UNIT - IV (6 Hours)

Material Management

Objectives of material management, material requirement, scheduling, monitoring, inventory control, inventory classification, inventory management, economic order quantity, inventory models, ABC analysis

UNIT - V (6 Hours)

Linear Programming

Identification & formulation of L.P. problem, requirements and assumptions of linear programming model, graphical method and simplex method

UNIT - VI (6 Hours)

Total Quality Management

Importance of total quality management in construction process and steps involved, concept of quality control, quality assurance, quality management and TQM, study of various quality standards in construction, six sigma concept, designing of quality manual, checklist and inspection reports, necessity of MIS in management

Assignments

1) Project Manager Education, experience, authority & responsibility.
2) Draw a bar chart for a building project.
3) Ladder network analysis.

4) ABC analysis of small building project.

5) Problems on linear programming, graphical and simplex method.

6) Total quality management.

7) Network analysis by CPM & PERT.

8) Network Updating

Term Work

1. Assignment on different types of organization and their flowcharts.
2. Assignment on bar chart.
3. Assignments on C.P.M. and P.E.R.T.`
4. Assignment on resource leveling.
5. Assignment on crashing of network.
6. Assignment on updating of network.
7. Assignment on ABC and EOQ analysis.
8. Assignment on linear programming, graphical and simplex method.
9. Study of quality control system of a construction project.
10. Prepare a network for any construction project containing minimum 25 activities and find out total float and free float.

Text Books

1. Construction Engineering and Management by S. Seetharaman, Umesh Publications, New Delhi.
2. PERT & CPM principles & applications by L.S. Srinath, affiliated East West press Pvt. Ltd., New Delhi.
3. Project Planning & control with PERT & CPM by Dr. B.C. Punmia, K.K. Khandelwal, Laxmi Publications (P) Ltd, New Delhi.

Reference Books

1. Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.

2. Construction Project Management Planning, Scheduling and controlling by K.K. Chitkara TMH Publishing Company, New Delhi
3. Inventory Control by L.C. Zhamb, Everest Publishing House
4. Project Management by Khatua, Oxford University Press
5. Project Planning, Analysis selection, Implementation & Review by Prasanna Chandra, Tata McGraw Hill, New Delhi
6. Civil Engineering Project Management by Alan C. Twort& J. Gordon Rees, Elsevier

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

34 : STRUCTURAL ANALYSIS - II

TEACHING SCHEME

Theory: 3 Hours / Week

CREDITS ALLOTTED

Theory : 3 Credits

Course Pre-requisites

The Students should have knowledge of

1. Structural Analysis- I
2. Mechanics of Solids

Course Objectives

To make student capble to analyse the structure.

Course Outcomes

The student will be able to

1. calculate plastic moment capacity of section.
2. draw Influence Line Diagrams(ILD) for reaction, Shear Force and Bending Moment
3. draw Influence Line Diagrams(ILD)for force in members of truss
4. analyse three hinge arch
5. analyse two hinge arch
6. analyse frame using approximate method.

UNIT - I (06 Hours)

Plastic Analysis of Structure

Elastic and Plastic moment capacity, Plastic hinge, Shape factor, Collapse mechanism, Applications to continuous beams, Fixed beams, Single bay single storied rectangular frames.

UNIT - II (06 Hours)

Influence Line Diagrams and rolling loads for beams

Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. Muller-Breslau's principle and its application to above beams. Rolling loads - Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values.

UNIT - III (06 Hours)

Influence Line Diagrams and rolling loads for truss:

Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.

UNIT - IV (06 Hours)

Analysis of Three Hinged Arch

Concept and types of arches, Three hinged arch – analysis, Calculation of horizontal Thrust, Radial Shear, Normal Thrust and BM at a cross section.

UNIT - V (06 Hours)

Analysis of Two Hinged Arch

Two hinged arches – Horizontal Thrust at support, Radial Shear, Normal Thrust and BM at a cross section. BM diagram for concentrated load and UDL.

UNIT - VI (06 Hours)

Approximate Methods of the Analysis:

Approximate methods of analysis of multistoried, multibay, 2-D rigid jointed frames by

i) Portal method
ii) Cantilever method
iii) Substitute Frame Method

Assignments

1) Calculate Plastic moment capacity of the cross section
2) Draw ILD for beams for reaction, SF and BM
3) Draw ILDs for members of the Truss
4) Analyse of three hinged arch
5) Calculate support reactions for two hinged arch.
6) Analyse frame using any approximate method
7) Calculate plastic moment for Beam.
8) Calculate maximum SF & BM due to moving loads on beam.
9) Calculate maximum axial force in truss due to moving loads.

Reference Books

1) Hibbeler R. C., "Structural Analysis", Prentice Hall Publication
2) Pandit G. S. & Gupta S. P., "Theory of Structures- Vol-II", Tata McGraw Hill Publication
3) Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication
4) Junnarkar S. B. & Adavi, "Mechanic of Structures", Charotar Publishing House
5) Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

35 : ADVANCED MECHANICS OF FLUIDS

TEACHING SCHEME

Theory: 03Hours / Week

Practical: 02Hours / Week

CREDITS ALLOTTED

Theory : 3 Credits

Termwork : 01 Credits

Course Pre-requisites

The Students should have knowledge of

1. Fluid Mechanics basics, Types of flows, friction.
2. Basic knowledge of Water retaining structure like dam, weir etc. irrigation channel.
3. Basic knowledge of Drag& lift, unsteady flow.
4. Basic knowledge of Hydro power plant.
5. Basic knowledge of pumps.

Course Objectives

To impart knowledge of open channel flows and hydraulic machinery to students.

Course Outcomes

The student will be able to

1. Design most efficient channel section, find critical depth of a flow.
2. Understand and apply knowledge of various flow profile and their characteristics.
3. Find energy dissipated in a hydraulic jump.
4. Calculate forces on vanes for different conditions.
5. Understand and apply knowledge of turbines.
6. Understand and apply knowledge of pumps.

UNIT - I (06 Hours)

Uniform Flow in Open Channels

Basic Equations: Continuity Equation, Bernoulli's Equation & Momentum Equation as applied to open channel one dimensional flow, Velocity distribution in open channel, Chezy's & Manning's formulae, factors affecting Manning's roughness coefficient, Normal depth, Conveyance Section factor, Most efficient channel section, Specific Energy, SpecificEnergy diagram, Depth-Discharge diagrams, alternate depths, Critical depth, Critical slopes, Froude number, Specific Force, Specific force diagrams, Conjugate depths, Depth-Discharge diagrams with respect to specific force.

UNIT - II (06 Hours)

Gradually Varied Flow in Open Channels

Gradually and rapidly varied flows, their examples, Basic assumptions in the derivation of GVF, Differential equations of GVF, Various GVF profiles,and their characteristics.

UNIT - III (06 Hours)

Rapidly Varied Flow:

Hydraulic Jump in Rectangular and Trapezoidal channels, Classification & Practical uses of Jump, Examples of occurrence of Hydraulic Jump, Conjugate Depths, Energy Dissipation in Hydraulic Jump, Location of Jump, Devices for measurement of velocity and discharge in open Channels, Stream gauging.

UNIT - IV (06 Hours)

Unsteady Flow:

Types, Flow through openings under varying head, Flow Compressibility, Celerity of Elastic Pressure Waves, Water Hammer Phenomenon, Rigid & Elastic water Columns Theories, Simple cases neglecting Friction, rapid acceleration of flow due to sudden opening of valve, surge tanks and their functions, Location and Classification.

UNIT - V (06 Hours)

Fluid Flow Around Submerged Bodies

Fluid Flow Around Submerged Bodies: Practical problems involving fluid flow around submerged bodies, Definition & Expression for Drag, lift, drag coefficient, Types of Drag.

UNIT - VI (06 Hours)

Hydraulic Machines

Impact of Jet: Force Exerted due to impact of jet on stationary and moving flat and curved plates using Linear Momentum Principle, Principle of Angular Momentum, Euler's Momentum Equation for Turbines.

Element of Hydropower plant, Hydraulic turbines, Heads & efficiencies, Governing of turbines, Cavitation in turbines, Performance of turbines, Prediction of performance in terms of unit quantities and specific quantities, specific speed.

Theory of centrifugal pump, Centrifugal head due to rotation, Heads & efficiencies, Cavitation, Prediction of performance in terms of specific quantities, specific speed, characteristiccurves.

Assignments (Any Six)

1. Solve Four Numericals to find out Critical Depth.
2. Solve Numerical on GVF to find out flow profiles
3. Solve Numericals on Hydraulic Jump to find out dissipation of energy.
4. Solve Numericals to find out forces on different types of vanes.
5. Solve Numericals on design of Turbines.
6. Solve Numericals on design of Pumps.
7. Collection & Study of Information Brochure about different Hydraulic Machineries.
8. Collection & study of information brochure about 0Hydralic lab instrument, Meterial and Machines companies.

Term Work: (Any Eight)

1. Flow around aerofoil.
2. Flow around a Circular Cylinder.
3. Impact of jet around flat / curved plate.
4. Performance Curves of Hydraulic Turbine.
   Constant Head Characteristic Curve
5. Characteristics of Centrifugal Pump.
6. Uniform flow formulae of open channel.
7. Velocity distribution in open channel flow.
8. Hydraulic jump as energy dissipater.
9. Characteristics of various GVF profiles.
10. Design of Hydraulic Centrifugal Pump.
11. Design of Hydraulic Turbine.
12. GVF Computations by Direct Step Method.

Text Books

1. Garde R. J., Mirajgaonkar A. G., “Engineering Fluid Mechanics”, Scitech Publication, Chennai
2. Rangaraju K. G., “Open Channel Flow”, Tata McGraw Publication
3. Streeter Wylie, “Fluid Mechanics”, Tata McGraw Publication
4. Subramanyam K., “Open Channel Flow”, Tata McGraw Publication
5. VenTe Chow, “Open Channel Hydraulics”, Tata McGraw Publication
6. C P Konthadraman, R Rroodramoorthy, “Fluid Mechanics &Machinery” New Academic Science

Reference Books:

1. Fox, McDonald, Pritchard, “Fluid Mechanics SI Version” Willey Student Edition
2. Frank M. White, “Fluid Mechanics”, McGraw Hills Series

Syllabus for Unit Test

Unit Test -1 UNIT – I,II,III

36 : PROFESSIONAL SKILLS DEVELOPMENT V

TEACHING SCHEME
Theory : 4 Hours / Week

CREDITS ALLOTED
Theory : 4 Credits

Course Pre-requisites

The Students should have knowledge of

1. Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. An overall idea about vocabulary, Public speaking skills taught in the last semester
3. Knowledge of writing skills, importance of professionalism in emails and letters.
4. Knowledge on handling criticism and the concept of conflicts.
5. Awareness of the interpersonal skills like team work and its importance in the corporate sector.

Course Objectives

The Professional Skills Development 5 is an extension of PSD- 4 with focus on the remaining topics of Aptitude, Reasoning and Grammar. The further complex concepts of Aptitude and Grammar aims to acquaint them with the topics and also provide them techniques to solve the question with tricks/methods in a very short period. The English communication and soft skills section of PSD-5 focuses on the higher aspects of soft skills training students on how to handle Group Discussions during placement process and other topics such as grooming them on how to handle conflicts effectively in the corporate scenario and also the correct attitude/approach to solve problems collectively from a team's perspective and also individually.

Course Outcomes

The student should be able to

1. Learn further concepts of Maths, Logical reasoning and English gram-

mar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics of tenses and Sub- verb agreement relevant from the recruitment point of view.

2. Use Mnemonics, and learn appropriate strategies to handle complex topics in GDs and ways to handle them. Students would learn the appropriate ways of stating opinions, disagreeing or communicating during the Group Discussion Process.
3. Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5. Students would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life. It would be a continuation of the topic covered during the previous semester PSD-4
6. Learn to handle Case studies effectively and incorporate the right approach towards Case Studies asked during the recruitment process.

<u>Unit I</u> (24Hours)

Aptitude (Maths, Logical Reasoning, English)

- Maths
    - Time, Speed & Distance
    - Time & Work
    - Simple Interest & Compound Interest in continuation
    - Maths Revision
- Logical Reasoning
    - Data Interpretation
    - Data Sufficiency
    - Set Theory & Syllogisms
    - Reasoning Revision
- English
    - Grammar – II – (Adjective, Verb, Sub- Verb Agreement)

- Grammar- (Tenses)
- Vocabulary
- Verbal Ability- Revision

Unit II (24Hours)

Soft Skills & English Communication

- Situational Conversation
- Situational Writing
- GD Orientation
- Mock GD-1
- Mock GD-2
- Mock GD-3
- Conflict Resolution
- Problem Solving Skills
- Time- Management Skills
- Handling Case Studies
- Management Games
- Business Meeting Etiquettes

Text Books

1. APAART: Verbal Ability
2. APAART: Logical Reasoning
3. APAART: Quantitative Aptitude
4. APAART: Speak Well 1 (English Language and Communication)
5. APAART: Speak Well 2 (Soft Skills)

OPTIONAL SUBJECT
ENGINEERING MATHEMATICS-IV

TEACHING SCHEME:	**CREDITS ALLOTTED:**
Theory: 04 Hours / Week	Theory : 04 Credits

Course Pre-requisites:

The Students should have knowledge of

1. Determinants
2. Matrices
3. Differentiation
4. Integration of functions
5. Differential equation

Course Objectives:

The course aims at making the students familiar about the most basic numerical methods and

concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.

Course Outcomes:

The student should be able to

1. derive appropriate numerical methods to solve algebraic and transcendental equations
2. evaluate the accuracy of common numerical methods.
3. develop appropriate numerical methods to solve a difference equation.
4. be familiar with numerical interpolation and approximation of functions , numerical integration and differentiation.
5. be familiar with numerical solution of ordinary differential equations.
6. To compute Numerical Solution of Partial Differential Equations.

UNIT - I

Numerical solutions of algebraic and transcendental equations (08 Hours)

Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.

UNIT - II

Solution of system of linear algebraic equation (08 Hours)

Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.

UNIT - III

Difference equation and Solution of difference equations (08 Hours)

Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.

UNIT - IV

Interpolation and Numerical differentiation and integration (08 Hours)

Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting: Method of least squares. Straight line, Second degree, parabola, Exponential curve.

Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.

UNIT - V

Numerical solution of first order ordinary differential equation (08 Hours)

Solution by Euler's method, Euler' Modified method, Taylor's series, Runga-kutta method, Milne's Predictors and Correctors method.

UNIT - VI

Numerical Solution of Partial Differential Equations (08 Hours)

Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.

Assignments:

1) Numerical Problems on algebraic and transcendental equations.
2) Numerical problems on system of linear algebraic equations.
3) Numerical Problems on difference equations using Boole's operator method.
4) Numerical Problems on simultaneous difference equation.
5) Numerical Problems on Curve fitting.
6) Numerical Problems on numerical integration.
7) Problems on numerical solution of first order ordinary differential equation.
8) Problems on numerical solution Partial Differential Equations.
9) Collect and solve question number 3 and 4 from recent three question paper of BVU.
10) Collect and solve question number 5 and 6 from recent three question paper of BVU.

These are minimum assignments recommended by the University and the faculty has choice to design and add few more assignments.

Text Books:

1. Gupta P.P.& Malik G.S., Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Mandir,Meerut, 21/e, 2006.
2. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 12/e, 2006.

Reference Books:

1. Francis J. Scheid, Schaum's Outline of Numerical Analysis, McGraw-Hill, New York, 1989.
2. S. S. Sastry, Engineering Mathematics, Vol I, II Prentice Hall Publication, 3/e, 2004.
3. C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co Ltd., 6/e,2003.

Syllabus for Unit Test:

Unit Test -1 UNIT – I,II,III

Unit Test -2 UNIT – IV,V,VI

37 : STRUCTURAL DESIGN-II

TEACHING SCHEME

Theory: 3Hours / Week

Practical: 2Hours / Week

Tutorial: 1 Hour/Week

CREDITS ALLOTTED

Theory: 4 Credits

Termwork:1 Credit

Course Pre-requisites

The Students should have knowledge of

1. conditions of equilibrium, plotting Shear force and bending moment diagram of beams with various support conditions and various load combinations.
2. Determination of bending stress and shear stress in beams.
3. Concept of short, long columns, direct and bending stress, principal stress and strains.
4. Concrete, concreting techniques and properties of concrete.
5. Plastic theory, concepts of planning of staircase, planning of a buiding.

Course Objectives

To make student capable to complete the design and detailing of a G+2 storied R.C.C.building.

Course Outcomes

The student will be able to

1. differentiate between various design philosophies of R.C.C. and know the properties of materials used in R.C.C. and the partial safety factors in Limit State Method .
2. differentiate between under-reinforced,over-reinforced and balanced section , analyse and design a singly reinforced, doubly reinforced and flanged beam by Limit State Method.

3. design beams for flexure,shear,bond for various supporting conditions
4. design different types of slabs and a staircase.
5. design short columns for axial load,uniaxial and biaxial bending by using SP-16.
6. design isolated column footings.

UNIT - I (6 Hours)

Materials and Design Approach:

Introduction of R.C.C: Materials: Types of reinforcements, Study of properties of concrete and properties of steel. Introduction to design philosophies of R.C. Structures: Working Stress Method, Ultimate Load method, Limit State Method. Various limit states, semi-probabilistic approach, partial safety factors for materials and loads, various structural elements and loads on the elements, Load combinations.

UNIT - II (6 Hours)

R.C. Sections in Flexure :

R.C. Sections in Flexure: Limit State Method: Assumptions, Strain variation diagram, Stress variation diagram; Concept of under reinforced, balanced, over reinforced section; Design parameters of a singly reinforced rectangular section, Moment of resistance of singly reinforced, doubly reinforced, rectangular, flanged section.

UNIT – III (6 Hours)

Beams :

Design of Beams for Flexure, Shear, Bond :Behaviour of R.C .beam in shear, Shear failure, Shear strength of beam Without shear reinforcement, Design of shear reinforcement. Bond–Introduction, types of bonds, Code provision.

Design of beams- Simply supported, cantilever, Continuous – Singly reinforced, doubly reinforced and flanged beam.

Introduction to Redistribution of moments in beams: Assumption, Requirements of I.S.456-2000. Various load combinations in continuous beams.

UNIT – IV (6 Hours)

Slabs

Design of Slabs: One Way Slabs: Simply Supported, Cantilever, Continuous

Two Way Slabs: Various support conditions

Design of Staircase: Dog legged, Open well

UNIT – V (6 Hours)

Columns

Design of Columns: Columns- Axially loaded short columns, requirements of minimum eccentricity;

Design of short columns for axial load, uniaxial, biaxial bending (use of SP 16); Checking safety of column for biaxial bending

UNIT-VI (6Hours)

Footings

Design of Footings: Footings- Design of isolated column footing for axial load, uniaxial Bending.

Term Work

1. Design of G+2 storied building for gravity loads only. The design should include all types of slabs, beams, columns, footings and staircase (two flights) (Maximum three students in a group)
2. Report of a site visit related to building structure under construction.
3. Four half imperial drawing sheets. Out of which two sheets to be drawn using drafting software.

Assignments : Any Six

1. Assignment based on various methods of design.
2. Assignment based on basic parameters in design-Limit StateMethod and Working Stress Method.
3. Assignment based on moment of resistance of a singly reinforced beam, doubly reinforced beam, flanged beam.
4. Assignment based on design of various types of slabs.
5. Assignment based on design of various types of beams.
6. Assignment based on staircase design.
7. Assignment based on design of various types of columns.
8. Assignment based on design of isolated footing.
9. Making the models of reinforcement in various types of slabs.
10. Making the models of reinforcement in various types of beams.
11. Making the models of reinforcement in columns.
12. Making the models of reinforcement in staircase.
13. Making the models of reinforcement in footing.

Text Books

1. Dr. V. L. Shah and Dr. S. R. Karve- “Limit State Theory and Design”, Pune VidyarthiGriha Publications
2. Punmia, Jain and Jain, “Comprehensive Design of R. C. Structures”, Standard Book House
3. S. S. Bhavikatti, “Design of R.C.C. structural elements”, New Age International Ltd.
4. P. Dayaratnam, “Limit State Analysis and Design”, Wheeler Publishing Company, New Delhi
5. P. C. Vergese, “Limit State Design”, Prentice Hall India Publications, New Delhi
6. Sinha R.C. “RCC Analysis and Design- Vol. I, II”, Chand and Co, New Delhi

I.S.Codes

1. I.S.456-2000, “Plain and Reinforced Concrete-Code of Practice”
2. I.S.875-1987 (Part I to V),”Code of Practice for Design Loads”
3. SP-16-1980, “Design Aids for Reinforced Concrete”

Reference Books

1. N.Subramanian“ Design of Reinforced Concrete Structures” Oxford University Press
2. M.Fergusson “ R.C.Fundamentals” - Tata Mcgraw Hill
3. S.UnnikrishnanPillai,DevidasMenon “Reinforced Concrete Design”-Tata Mcgraw Hill Companies
4. Dr.H.J.Shah “Reinforced Concrete –Vol.1 (Elementary Reinforced Concrete)” –Charotar Publications

Syllabus for Unit Test

Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

38 : ENVIRONMENTAL ENGINEERING - I

TEACHING SCHEME		CREDITS ALLOTTED
Theory:	3 Hours / Week	Theory: 3 Credits
Practical:	2Hours / Week	Termwork : 1 Credit

Course Pre-requisites

The Students should have knowledge of

1. Engineering chemistry.
2. Engineering mathematics.

Course Objectives

To make student aware of water treatment, air pollution, solid waste management and environmental management

Course Outcomes

The student will be able to

1. Explain the water quality criteria and drinking water quality standards.
2. Explain aeration and sedimentation process of water treatment.
3. Describe filtration, disinfection and advanced water treatment processes.
4. Enumerate the various aspects of air pollution.
5. Describe the solid and hazardous waste management.
6. Explain the aspects of environmental management.

UNIT - I (06 Hours)

Water - Quantity, Quality and standard

Water - Surface water sources, Ground water Sources, Water demand and quantity, various demands, Conveyance of water, Factors affecting demand, Design period, population forecasting, Quality of Water of various sources, Common impurities and their effects, Physical, Chemical, Biological, radiological characteristics of water, Drinking water quality standards, Different flow sheets of Water Treatment Plant (WTP) based on sources of Raw water for Rural and Urban.

UNIT - II (06 Hours)

Treatment - Aeration and Sedimentation

Aeration : Types of aerators, gravity aerator and fixed spray aerator.

Sedimentation:Plain Sedimentation, Principles and types of plain Sedimentation, details of Sedimentation tank, types of tanks, inlet and outlet arrangements; Design criteria like surface overflow rate, detention time, weir loading, depth of tank. Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clari-flocculator; Tube settlers: Introduction, Design of Tube settler

UNIT - III (06 Hours)

Treatment - Filtration, Disinfection and Advance Technology

Filtration:Necessity, mechanisms, Theory of filtration, types of filters, pressure filters, dual and multimedia filters, Different media, details of filter, Rapid sand filter and slow sand filter, design criteria, working and washing of rapid sand filter, design of rapid sand filter. Disinfection: Necessity, Different methods, chlorination, reactions involved, Free And combined residual chlorine, Break point chlorination. UV disinfection, OzonationAdvance Treatment Methods:Water Softening- Chemical and ion exchange methods, Fluoridation and defluoridation, desalination, membrane technologies.

UNIT - IV (06 Hours)

Air Pollution and Control

History of Air pollutants, Sources and classification of pollutants and their effects on human health, vegetation and property. Ambient air quality and emission standards, Air Pollution Control Principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate Matter Control: settling chambers, cyclone separation, Wet collectors, fabric filters, and electrostatic precipitators.

UNIT - V (06 Hours)

Solid and Hazardous Waste Management

Introduction and need for solid and hazardous waste management, Sources, Legislations, Waste Generation, Composition, Source reduction of wastes, Handling and segregation of wastes at source, storage and collection, Transport, Labeling and Handling of Hazardous Wastes, Waste processing, Composting, Solid Wastes Disposal in Landfills, secure landfills and landfill bioreactors, landfill remediation, Elements of integrated waste management.

UNIT - VI (06 Hours)

Environmental Management

Fundamentals of Environmental Management, Introduction to Environmental Management Systems- ISO 14000 series, Environmental Management Plans, Rules and Regulations of Environmental laws in India (Water and Air), Eco – labeling, Introduction to Life Cycle Assessment (LCA), Environmental Impact Assessment (EIA) and Environmental audits

Assignments

1. Draw and explain flow sheets of water treatment plant for different types of water sources
2. Numericals on design of flocculator, sedimentation tank and tube settler.
3. Information about various types of filtration units
4. National ambient air quality standards and control methods of air pollutants
5. Experiences of solid waste management.
6. EIA studies

7. Case study on EMS ISO 14000
8. Case study on Life cycle assessment
9. Case study on Environmental audit.

Term Work: (Any Eight)

1. Determination of pH and alkalinity of water samples
2. Determination of Total Hardness and its components of water samples
3. Determination of Chlorides of water samples
4. Determination of Turbidity and optimum dose of alum for raw water samples.
5. Determination of Optimum dose of chlorine and residual chlorine for water samples.
6. Determination of calorific value and/or energy content of the solid waste.
7. Determination of concentration of trace metals (Al, Mn, Cu, Ni, Zn, Pb, Cd, Fe, N, P. K) from water, solid waste, air and soil samples.
8. Determination of PM 2.5 in ambient air samples.
9. Determination of concentration of Particulate matter and gaseous pollutants in industrial stack.
10. Determination of concentration of carbon di-oxide from ambient air/industry/automobile
11. Site visit
12. Study of EIA report of infrastructure project.

Text Books

1. Wark Kenneth and Warner C.F, Air pollution its origin and control. Harper and Row Publishers, New York, 1981.
2. Rao C.S., Environmental pollution control Engineering, New age international Ltd, New Delhi, 1995.
3. Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.

4. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw- Hill, New York, 1993
5. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.
6. Dr. M. N. Rao and Dr. Razia Sultana, ' Solid and Hazardous Waste management'BSP Books Pvt. Ltd. 2012
7. I. V. Murali Krishna and ValliManickam,'Environmental Management', BSP, Books Pvt. Ltd. 2014

Reference Books

1. S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behavior, Wiley 1977.
2. Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
3. J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
4. Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006.
5. Solid Waste Management, Van Nostrand Reinhold Co. 1975
6. C.L. ell, Solid Waste Management, John Wiley, 1975
7. P.W. Powers. How to dispose of toxic substances and industrial Waste, Noyes Data Corporation, England, 1976.

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

39 : ESTIMATING, COSTING AND VALUATION

TEACHING SCHEME		**CREDITS ALLOTTED**
Theory:	3Hours / Week	Theory -4 Credits
Practical:	2 Hours / Week	Termwork -1 Credit
Tutorial :	1 Hour/ week	

Course Pre-requisites

The Students should have knowledge of

1. Building Construction and Building planning and Design.
2. Structural Design I and Structural Design II.
3. Surveying and leveling
4. Environmental Engineering I
5. Infrastructure Engineering

Course Objectives

To prepare the students to make estimate of building, road, and other civil engineering structures

Course Outcomes

The student will be able to

1. explain the specifications for different construction works and materials..
2. prepare estimate of the buildings, and other civil engineering structures.
3. Carryout rate analysis of different items of construction work.
4. carryout the valuation of civil engineering structures.
5. fill the tenders documents.
6. compare different types of contracts

UNIT - I (6 Hours)

Estimating: Definition, importance of quantity surveying, types of estimates, data required for estimates, units of measurement & principles deciding the units, mode of measurement of building works. Abstracting, bill of quantities. Provisional & prime cost items, contingencies, establishment charges, centage charges, Schedule of rates (D. S. R.)

Approximate Estimate: Definition, purpose, methods of approximate estimation of building & other civil engineering projects like roads, irrigation & water supply &sanitary engineering, electrical works.

UNIT - II (6Hours)

Methods of Taking out quantities: long wall, short wall method and centre line method of taking out quantities for different items of building. Estimate of RCC members. IS Codes used for estimating.

Specifications: Definition& purpose, types, standard specifications. Drafting detailed specifications with reference to materials, quality, workmanship, method of execution, mode of measurement and payment, for major items such as earthwork, stone/brick masonry, plastering, ceramic tile flooring, R.C.C. work.

UNIT - III (6Hours)

Analysis of rates: Factors affecting cost of an item of work, materials, sundries, labour, Tools & plant, overheads & profit. Task work - definition & factors affecting task work. Analysis of rates of any five items.

Estimate of Road: Methods of estimate of earthwork for road, canal. Estimate of different types of roads.

UNIT - IV (6Hours)

Valuation of Properties: Purpose, nature of value, price, cost and value, types of value. Factors affecting value of property. Concept of free hold and lease hold property.

Depreciation & methods of working out depreciation, sinking fund, Years purchase, out goings. Methods of Valuation of Building: Land & building basis, Rental basis, Reproduction & replacement cost basis. O_1 form

UNIT - V (6Hours)

Tenders: Definition. Methods of inviting tenders, tender notice, Pre-qualifications of contractor, tender documents, preparation of tenders. Submission in 3 bid/ 2 bid or single bid system. Qualitative and quantitative evaluation of tenders, E tendering. Comparative statement, pre- bid conference, acceptance of tenders, various forms of BOT tenders, global tendering. (A mockup exercise of preparation, submission, opening of tender documents is suggested). PPP contracts.

UNIT - VI (6Hours)

Contracts: General idea, types of contracts viz: lump sum, item rate, cost plus,Conditions of contracts. FIDIC document, standard contract conditions published by MOS and PI, Law of contract. Definition, objective & essentials of valid contract.

Conditions of contract: General and Specific conditions. Condition regarding EM, SD, time as an essence of contract. Important conditions regarding addition, alteration, extra items, testing of materials, defective work, subletting, powers delegated to Engineer incharge regarding the above aspect, defect liability period, retention money, interim payment or running account bills, advance payment, secured advance, final bill.

Settlement of disputes viz. dispute resolving board, arbitration, concept of partnering. Indian Contract Act. Liquidated damages, termination of contract.

Assignments

1. Approximate estimate of different types of buildings
2. To determine quantities of different items of building and preparation of specifications for construction materials (Any five)

3. Rate analysis.
4. To carryout the valuation of existing building.
5. Mock up exercise of submission of tender.
6. Types of contracts.
7. To prepare estimate of plumbing of building.
8. To prepare roak estimate.

Term Work

1. Estimate of different structures using long wall short wall method and centre line method
2. Detailed estimate of a single storied R. C. C. framed building using D.S.R. rates
3. Working out quantities of steel reinforcement for a slab, a beam, column, footing and preparing bar bending schedule.
4. a) Detailed estimate of roadwork . b) Assignment on road earthwork calculations.
5. Estimating quantities for any two of the following

   a) House drainage & water supply arrangement.b) Pipe culvert or slab culvert. c) Septic tank.
6. Drafting detailed specifications of any five items .
7. Assignment on valuation of building. (O1 form)
8. Preparation of draft tender notice.
9. Rate analysis for any five items.

Text Books

1. Estimating and Costing By: Rangwala Published By: Charotar Publishing House, Anand
2. Estimating, Costing Specifications & valuation in Civil Engineering By: M.Chakraborty

Reference Books

1. Estimating and Costing in Civil Engineering: Theory and Practice, By: B.N Dutta. Published By: S. Dutta & Company, Lucknow.
2. Civil Engineering Contracts & Estimates By: B.S.Patil Published, Orient LongmanLtd. Mumbai.
3. I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.
4. D.S.R: District Schedule of Rates

Syllabus for Unit Test

Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

40 : GEOTECHNICAL ENGINEERING

TEACHING SCHEME	CREDITS ALLOTTED
Theory: 03Hours / Week	Theory: 03 Credits
Practical: 02Hours / Week	Termwork : 01 Credit

Course Pre-requisites

The Students should have knowledge of

1. Engineering Mathematics
2. Engineering Mechanics
3. Fluid Mechanics

Course Objectives

To make student capable

to determine the properties of soil and use of soil as a construction material.

Course Outcomes

The student will be able to

1. determine weight - volume relation in soil as a three phase system
2. determine index properties of soil.
3. carryout the compaction and consolidation process.
4. calculate the geostatic stresses and coefficient of permeability.
5. measure the shear strength of soil by various methods.
6. calculate the active and passive earth pressure by various methods.

UNIT - I (6 Hours)

Introduction to soil mechanics

Soil, Soil formation, soil types its composition, soil structures, clay mineral, soil mechanics, history and development of soil mechanics, basic definitions, weight volume relations in soil as three phase system,soil classification systems – USCS, IS, HRB, Textural classification, Activity of clay, Sensitivity of clay, Thixotrophy of clay

UNIT - II (6 Hours)

Index Properties of Soil

Index properties of soil – Water content, specific gravity, particle size distribution, Consistency limits, density, relative density

UNIT - III (6 Hours)

Permeability and Seepage Analysis

Stresses within a soil, effective stress principle, stress point and stress path, Soil - water systems- capillarity, flow, Darcy's law, permeability, and tests for its determination, head gradient and potential, seepage pressure, Upward flow condition, 2 D flow, Laplace equation, flow net and applications.

UNIT - IV (6 Hours)

Compaction and Stress Distribution

Compaction: - Laboratory compaction tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Field compaction; compaction specifications and field control.

Stresses in soil: Geostatic Stresses, stress distribution, Bossinsque's Theory for point load, Westergaard's theory

UNIT - V (6 Hours)

Shear Strength

a) Introduction- Shear strength an Engineering Property. Mohr's stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / porewater pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strainbehavior of sands and clays.

b) Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, UnconfinedCompression test, Vane Shear test. Their suitability for different types of soils, advantages anddisadvantages. Different drainage conditions for shear tests.

UNIT - VI (6 Hours)

Earth Pressure Theories

a) Earth Pressure- Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill,

b) Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's graphical method of determination of earth pressure.

Term Work

Term work shall consist of the following experiments (Any Ten)

1. Determination of water content by oven drying method
2. Determination of specific gravity of coarse and fine grained soil
3. Classification of soil by sieve analysis
4. Determination of consistency limits – Liquid, plastic and shrinkage limit
5. Determination of in situ density test – Core cutter and sand replacement method
6. Determination of coefficient of permeability by –

   a) Constant Head Method b) Falling Head Method
7. Determination of OMC and MDD by Standard Proctor Test and Modified Proctor Test
8. Determination of shear parameters by Direct Shear Test.
9. Determination of Unconfined Compression Strengthof soil
10. Determination of shear parameters Triaxial Shear Test
11. Determination of shear parameters Vane Shear Test

Assignment

1. Study of various relationships between weight and volume, numerical based on it and classification of soil.
2. Classification of soil based on the index properties of soil.
3. Study of permeability and numerical based on it.
4. Study of Proctor tests, different field compaction equipments.
5. Determination of shear strength, numerical problems based on it.
6. Numerical problems based on earth pressure.
7. Numericals based on stress distribution.
8. Numericals based on compaction properties.

Text Books

1. Murthy, V.N.S., "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers.
2. Ranjan, G. and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers.
3. K.R.Arora, " Soil Mechanics & Foundation Engineering,
4. Punmia B.C., "Soil Mechanics and Foundation Engineering" Laxmi Publications
5. C. Venkatramaiah, "Geotechnical Engineering", New Age International Publishers
6. Gulati, Manoj Dutta, "Geotechnical Engineering", Tata McGraw Hill Publications

Reference Books

1. Terzaghi Karl, Ralph B. Pech, "Soil Mechanics in Engineering Practice", AWiley International Edition.
2. Holtz, R.D. and Kovacs, W.D., "An Introduction to Geotechnical Engineering", Prentice Hall.
3. Lambe, T.W. and Whitman, R.V., "Soil Mechanics", John Wiley and Sons.

4. Couduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India.
5. Das, B.M., “Principles of Geotechnical Engineering”, Thomson Asia.
6. Korner Robert M. “ Construction and Geotechnical Engineering” Tata McGraw Hill Publications Company, New Delhi
7. Joseph E. Bowels, “Soil mechanics and Foundation Engineering”, Tata McGraw Hill Publications Company, New Delhi

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 (A) : ELECTIVE-I : FINANCIAL MANAGEMENT

TEACHING SCHEME	CREDITS ALLOTTED
Theory: 03 Hours / Week	Theory - 03

Course Pre-requisites

The Students should have knowledge of

1. Project Management
2. Economics and Management
3. Construction Techniques and machinery.

Course Objectives

To make student capable to prepare company's financial position for decision making.

Course Outcomes

The student will be able to

1. manage financial planning of a construction project.
2. forecast financial requirement of a construction firm.
3. analyze Time-Value of Money.
4. determine working capital for construction Project.
5. apply theories of capital structures.
6. carry out risk analysis of budget.

UNIT - I (6 Hours)

Introduction to Financial Management

Scope and Functions of Financial Management, Role of Finance Manager, Organization of the Finance function, Financial Planning, Financial Statement Analysis

UNIT - II (6Hours)

Financial Planning

Introduction, Objectives and steps in Financial planning, Factors affecting financial planning, estimation of financial requirement of a construction firm, Capitalization, Sources of Financing

UNIT - III (6 Hours)

Capital Budgeting

Time Value of money – Future value of a single cash flow, annuity, Present value of Single Cash flow, Present Value of Uneven Cash flow, Discounting and Non-discounting techniques –NPV, IRR, BCR and Payback period.

UNIT - IV (6 Hours)

Working Capital Management

Importance and Objectives, factors affecting working Capital, Determination of Working Capital, Working capital financing policy

UNIT - V (6 Hours)

Capital Structure

Introduction, Salient features of Capital Structure, Factors influencing capital structure, Theories of Capital structures – EBIT and MM approach, Financial Management in India.

UNIT - VI (6 Hours)

Risk Analysis in Capital Budgeting

Introduction, Types and Sources of Risk in Capital Budgeting, Risk Adjusted Discount Rate, Certainty Equivalent Approach, Probability Distribution Approach, Sensitivity Analysis, Simulation Analysis

Assignments: (Any Six)

1. Assignment on Financial Management.
2. Assignment on Financial Planning.
3. Assignment on Balance Sheet & Profit-Loss statement.
4. Assignment on Cash flows.
5. Assignment on NPV, BCR and IRR
6. Assignment on working Capital Management with reference to case study.
7. Assignment on EBIT approach.
8. Assignment on MM approach.
9. Assignment on sensitivity analysis.
10. Assignment on simulation.

Text Books

1. Financial Management, I.M. Pande, Vikas Publication
2. Financial Management, C. Paramasivam& T. Subramaniam, New Age International (P) Limited, Publishers.

Reference Books

1. Financial Management, An Introduction, Jim McMenamin, Taylor and Francis
2. Financial Management, M.Y. Khan, P.K. Jain, Tata McGraw Hill Publication
3. Financial Management, Prasanna Chandra, Tata McGraw Hill Publication

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

41 (B) : ELECTIVE-I - ADVANCED STRUCTURAL ANALYSIS

TEACHING SCHEME	CREDITS ALLOTTED
Theory: 3 Hours / Week	Theory: 3 Credits

Course Pre-requisites

The Students should have knowledge of

1. Structural Analysis- I
2. Structural Analysis- II

Course Objectives

To make students capable to analyse the structure.

Course Outcomes

The student will be able to

1. calculate deflection of beams and frames using Castigliano's first theorem.
2. analyze deflection of beams and frames using Castigliano's second theorem,
3. analyze indeterminate beams using Stiffness matrix method.
4. analyze indeterminate frames using Stiffness matrix method.
5. analyze indeterminate beams using Flexibility matrix method.
6. analyze indeterminate frames using Flexibility matrix method.

UNIT - I (06 Hours)

Deflection of Beams and Plane Frames using Strain Energy Method

Deflection of determinate beams and rectangular portals by application of Castigliano's first theorem;

UNIT - II (06 Hours)

Analysis of Beams and Plane Frames using Strain Energy Method

Analysis of indeterminate beams and rectangular portals by application of Castigliano's second theorem with indeterminacy up to two degrees.

UNIT - III (06Hours)

Analysis of Beams using Stiffness Matrix Method

Stiffness matrix method of analysis, Formulation of stiffness matrices, Applications to indeterminate beams. (Involving not more than three unknowns).

UNIT - IV (06 Hours)

Analysis of Plane Frames using Stiffness Matrix Method

Formulation of stiffness matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).

UNIT - V (06 Hours)

Analysis of Beams using Flexibility Matrix Method

Flexibility matrix method of analysis, Formulation of flexibility matrices, Applications to indeterminate beams. (Involving not more than three unknowns).

UNIT - VI (06 Hours)

Analysis of Plane Frames using Flexibility Matrix Method

Formulation of flexibility matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).

Assignments

1) Calculate deflection of beams using Castigliano's first theorem
2) Analyse indeterminate beams or rectangular portals by application of Castigliano's second theorem
3) Calculate stiffness matrix for beams
4) Calculate stiffness matrix for frames
5) Calculate flexibility matrix for beams
6) Calculate flexibility matrix for frames
7) Analyse beam using stuffnes matrix.
8) Analyse frame using stiffness.
9) Analyse beam using flexibility matrix.

Reference Books

1) Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication
2) Pandit G. S. & Gupta S. P., “Matrix Methods of Structural Analysis”, Tata McGraw Hill Publication
3) Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co.
4) Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.
5) Wilbur & Norris, “Basic Structural Analysis” Tata McGraw Hill Publication
6) Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill Publication
7) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication
8) Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company
9) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication
10) Junnarkar S. B. & Adavi, “Mechanic of Structures”, Charotar Publishing House

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 (C) : ELECTIVE I : URBAN WATER MANAGEMENT

TEACHING SCHEME	**CREDITS ALLOTTED**
Theory: 03Hours / Week	Theory :03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Physics, Chemistry, Mathematics and Statistics
2. Ecology, Hydrology, Environment and Climate Change
3. Water Engineering and Management

Course Objectives

To learn Urban Water Management (UWM) which promises a better approach than the current system, in which water supply, sanitation, storm water and wastewater are managed by isolated entities, and all four are separated from land-use planning and economic development and adopt UWM and its adaptive, iterative processes will help cities significantly reduce the number of people without access to water and sanitation by providing water services of appropriate quantity and quality, thereby improving the health and productivity of urban residents.

Course Outcomes

The student will be able to

1. Understand how cities are growing and changing which is leading to describing the promise of IUWM and how some city case studies that explore the ways in which aspects of IUWM have been put into practice, since every city faces a different challenge and requires context-appropriate solutions.
2. Focus on the implications of these changes for urban water resources: in the past, water security efforts focused on water quantity and understand how new concerns about water quality are now emerging.

3. Understand and design the new tools and strategies to shift from urban water management to IUWM, and develop flexible and adaptable urban water systems.
4. Gain insight that how UWM can contribute to cities' resilience in the face of climate change and analyze changing climate demanding water management be approached in a different way.
5. Understand, apply and develop an enabling environment for the change toward a framework for integrated urban water management.
6. Design, analyze and apply practical approaches for constructing and building GREENand SMART cities that are inclusive, productive, well governed, and sustainable which leads to foster a new culture of urban water management.

UNIT - I (6 Hours)

Introduction to Urban Water Management

Introduction to Urban Water Management (UWM): Concept, Need, The changing urban context, Expanding city limits, Consequences of globalization and Urbanization, Urban-Rural Conflicts, Special challenges for some cities

UNIT - II (6 Hours)

Water resources and urbanization

Water: Sources, Quantity and Quality, Wastewater: Sources, Quality and Reuse , Effects on Water Demand due to Urbanization, Water Cess Act, Water(Prevention and Control) Act 1974

UNIT - III (6 Hours)

UWM tools and management strategies

Storm water management, Water reclamation and reuse, Water audits and efficient use, Flexible and adaptable urban water systems, Tariffs, payments and other economic tools, Benefit Cost Ratio for Urban Water Management

UNIT - IV (6 Hours)

Climate Change Challenge

Climate Change: Introduction, Cause and Consequences, Climatic Variations in India in recent years, Effect of Climate change on Water Resources and Sanitation, Urban contributions to climate change, Response options , Resilience to climate change.

UNIT - V (6 Hours)

Conventional and Integrated Urban Water Management

Conventional Urban Water Management: Introduction, Present Scenario, Advantages and Disadvantages, Integrated Urban Water Management (IUWM): Introduction, Need, Advantages, Urban water governance, Application of IUWM for SMART CITY

UNIT - VI (6 Hours)

Framework for integrated urban water management

Role of Central and Local governments, Involvement of Private sector, Business opportunities and Employment Enhancement, Participation of NGO's and Stakeholder, Sustainable Development and Practices

Assignments

1. Collection of data how cities are growing and changing describing the promise of IUWM
2. Study of urban water resources: in the past and how new concerns about water quality are now emerging.
3. Design new tools and strategies to shift from Conventional urban water management to IUWM
4. Study and data collection of climate change and analyze changing climate demanding water management be approached in a different way.
5. Design framework for integrated urban water management for Existing and Futuristic SMART Cities

6. Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities to foster a new culture of urban water management.
7. Field Visit and Report on SMART City and/orTownship in India and/or abroad
8. Suggest suitable plan for a city to be smarter.

Text Books

1. Urban Water Engineering and Management by Mohammad Karamouz, Ali Moridi, Sara Nazif, January 20, 2010 by CRC Press Textbook, ISBN 9781439813102 - CAT# K10665
2. Municipal Stormwater Management, Second Edition by Thomas N. Debo, Andrew Reese, November 25, 2002 by CRC Press, Reference – 1176, ISBN 9781566705844 - CAT# L1584
3. Urban Storm Water Management by HormozPazwash, April 28, 2011 by CRC Press, Reference – 550, ISBN 9781439810354 - CAT# K10518
4. Integrated Urban Water Management: Humid Tropics: UNESCO-IHP by Jonathan N. Parkinson, Joel AvruchGoldenfum, Carlos Tucci, March 26, 2010 by CRC Press, Reference – 180, ISBN 9780415453523 - CAT# K10165, Series: Urban Water Series
5. Water in Central Asia: Past, Present, Future by Victor A. Dukhovny, Joop de Schutter, January 25, 2011 by CRC Press, Reference – 432, ISBN 9780415459624 - CAT# K00021
6. The Economics of Sustainable Urban Water Management: the Case of Beijing: UNESCO-IHE PhD Thesis by Xiao Liang, September 28, 2011 by CRC Press, Reference – 200, ISBN 9780415691734 - CAT# K13927
7. Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations by HolgerTreidel, Jose Luis Martin-Bordes, Jason J. Gurdak, December 2, 2011 by CRC Press, Reference – 414, ISBN 9780415689366 - CAT# K13833, Series: IAH - International Contributions to Hydrogeology
8. Metropolitan Sustainability: Understanding and Improving the Urban Environment Edited by F Zeman, Royal Military College of Canada,

Canada, September 2012, Woodhead Publishing, ISBN: 978-0-85709-046-1

9. Designing the Urban Future: Smart Cities Kindle Edition by Scientific American Editors, Kindle Edition, Kindle eBook, 31 Mar 2014

10. Urban Water Supply and Sanitation in Southeast Asia: A Guide to Good Practice by Arthur C. McIntosh, ASIAN DEVELOPMENT BANK, ISBN 978-92-9254-554-3 (Print), 978-92-9254-555-0 (PDF), Publication Stock No. TIM135915-2

11. Water Resources and Economics In association with International Water Association (IWA), Editor-in-Chief:Prof. Dr. Roy Brouwer, ISSN: 2212-4284, ELSEVEIR

12. Water and Cities: Ensuring Sustainable Futures, Apr 2015, ISBN : 9789264230149 (PDF) ; 9789264230101 (print)

13. Water Management: Performance and Challenges in OECD Countries, Mar 1998, ISBN : 9789264162600 (PDF) ; 9789264160781 (print)

14. Good Practices in Urban Water Management: Decoding Good Practices for a Successful Future Edited by AnandChiplunkar, KallidaikurichiSeetharam,CheonKheong Tan, 2012, Asian Development Bank, National University of Singapore, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF), Publication Stock No. BKK102333

15. Strategic Planning of Sustainable Urban Water Management, P-A Malmqvist, G Heinicke, E Korrman, TA Stenstrom, G Svensson, 2006, IWA Publishing, ISBN13: 9781843391050, eISBN: 9781780402413, Categories: Utility / network management, Urban water

17. Climate Change and Water: International Perspectives on Mitigation and Adaptation edited by Carol Howe, Joel B. Smith, MS. Jim Henderson, American Water Works Association and IWA Publishing, ISBN: 978-1-58321-730-6

18. Climate Change and Water Resources by Younos, Tamim, Grady, Caitlin A (Eds.) , ISBN 978-3-642-37586-6, Springer, USA

19. Climate Change, Water Supply and Sanitation: Risk Assessment, Management, Mitigation and Reduction by Adriana Hulsmann,

GescheGrützmacher, Gerard van den Berg, Wolfgang Rauch, Anders Lynggaard Jensen, Victor Popovych, Mario Rosario, Lydia S. Vamvakeridou-Lyroudia, Dragan A. Savic, 2015, ISBN13: 9781780404998, eISBN: 9781780405001, Categories: Developing Countries, Water resources / environment, Water supply & treatment

Reference Books

1. Integrated Urban Water Management By AkiçaBahri, Global Water Partnership Technical Committee (TEC), TEC BACKGROUND PAPERS, NO. 16, ISBN: 978-91-85321-87-2
2. Good Practices in urban water management: Decoding good practices for a successful future edited by Chiplunkar, Anand, KallidaikurichiSeetharam, and CheonKheong Tan, Mandaluyong City, Philippines: Asian Development Bank, 2012, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF)
3. Integrated Urban Water Management for Planners By John Y. Whitler and Jennifer Warner, Water Research Foundation, PAS Memo — September/October 2014, American Planning Association, 205 N. Michigan Ave., Ste. 1200, Chicago, IL 6060

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

41 (D) : ELECTIVE-I: DOCKS, PORTS AND HARBOURS

TEACHING SCHEME	CREDITS ALLOTTED
Theory: 03 Hours / Week	Theory: 03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Fluid Mechanics
2. Advanced Surveying (Hydrographic Survey)

Course Objectives

To make student to understand different marine structures and their design considerations.

Course Outcomes

The student will be able to

1. describe development of port.
2. describe the wave, tide and the phenomenon related to the same.
3. explain different harbour and port facilities.
4. design the breakwaters.
5. explain the port planning.
6. explain marine pollution.

UNIT - I (6 Hours)

Introduction to Ports and Harbours

History, development of port and ship construction technology along with International trade, Port Development – Indian Scenario

UNIT - II (6 Hours)

Waves and Tides

Concept of generation, propagation and form of wave in coastal zone, global tide phenomenon, types of tides concept of wave tranquility, resonance, coastal sediment transport

UNIT - III (6 Hours)

Ports and Harbours

Harbour : classification, facilities and structures, Approcah channel, Marker Buoys, Breakwater layout, Berth and Jetties, Bulk oil container

Ports: Loading unloading, storage, customs and relevant facilities, security, hospital colony, Associated Services, Maintenance facilities, Dry docks, Slipway, locks.

UNIT - IV (6 Hours)

Marine Structures

General design aspects, breakwaters - function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories- function, types, suitability, design and construction features.

UNIT - V (6 Hours)

Port Planning

Modernization of port, Lifting and loading unloading (RORO) facilities, Computerization, Automation, berth occupancy, Port Cost Analysis, Dredging and disposal technology.

UNIT - VI (6 Hours)

Port Development

Role of port development and national policy, Public and private sector, Marine pollution and environmental aspects.

Assignments:

1. Explain history and development of port in India.
2. Write the concept of wave generation and propagation in coastal zone
3. Explain the facilities provided at ports and harbours.

4. Design a breakwater with the data given.
5. Write different aspect of port planning.
6. National policy for port development and environmental aspect of it.
7. Site visit to CW & PRS

Text Books

1. Basic Coastal Engineering, R.M.Sorenson, J.Wiley& Sons, 1978
2. Docks and Harbour Engineering,H.P.Oza and G.H.Oza, Charotar Publishing 2013
3. A Course in Docks and Horbour Engineering, S.P.Bindra, Dhanpatrai Publications
4. Harbour, Dock and Tunnel Engineering,R.Shrinivasan, Charotar Publishing House Pvt.Ltd (2013)

Reference Books

1. Oceanographical Engineering, R.L.Wiegel, Prentice –Hall 1964
2. Coastal Engineering, Vols. 1 and 2 , R. Silvester Elsevier Scientific Publishing Co., 1974
3. N I O Design Manual

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

41 (E) : ELECTIVE-I : HUMAN RESOURCE MANAGEMENT

TEACHING SCHEME	**CREDITS ALLOTTED**
Theory: 3 Hours / Week	Theory: 03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Engineering Economics Management
2. Project Management

Course Objectives

To develop the skill of human resource management in construction industry.

Course Outcomes

The student will be able to

1. discuss the significance of human resources in construction industry.
2. plan human resources.
3. describe the recruitment and selection process.
4. discuss the significance of training and development of employees.
5. analyze the employee benefits and incentives.
6. describe employee management relations.

UNIT - I (6 Hours)

Introduction

History of HRD, Objectives, Functions, HRD inConstruction industry, status of construction labour.

UNIT - II (6 Hours)

Human Resource Planning

Formulating human resource plans,various methods, job analysis, job specifications and job design inconstruction projects, forecasting personal needs and supply in construction sector.

UNIT - III (6 Hours)

Recruitment & selection

Selecting project manager & project team, external & internal recruitment. Data gathering methods, skill requirement of construction personnel.

UNIT - IV (6 Hours)

Training & Development

The training Process, Individual and organizational development, change management, performance appraisal, use of performance appraisal information establishing the evaluation system, Performance Management / Encouragement, Rewarding Employees

UNIT - V (6 Hours)

Employee Benefits

Employee health and safety, wage and salary administration, incentive system, wages of construction industry, Retirement and pensions.

UNIT - VI (6 Hours)

Employee Management Relations

Collective Bargaining, Effective ways of working, tradeunions act, labour welfare act, payment of wages act, workers compensation act ,contract labour act, management of conflicts.

Assignments

1. Case study of HRD in construction industry
2. Formulating human resource plan
3. Case study of external and internal recruitment
4. Report on establishing evaluation system for performance appraisal
5. Importance on Employee benefits
6. Report on conversation with HR of any construction industry

Text Books

1. "Human Resource Development and Management" by "Biswanath Ghosh", Vikas Publishing House Pvt. Ltd.
2. "Human Resource Management" by "S.C. Agarwal", Dhanpat Rai Publications
3. Personnel & Human resource Management – C.B. Mamoria, Himalaya Publishing House

Reference Books

1. Human resource management –Subbarao, Himalaya Publishing House
2. Human Resource Management— K. Aswathappa, TMH Pvt. Ltd
3. "Human Resource Management" by "John Stredwick"
4. International Human Resource Management--- Gary Diesler

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 (F) : ELECTIVE-I - GREEN CONSTRUCTION PRACTICES.

TEACHING SCHEME	CREDITS ALLOTTED
Theory: 03Hours / Week	Theory:03 Credits

Course Pre-requisites

The Students should have basic knowledge of

conventional construction practices, green materials and immerging trends in the green building industry.

Course Objectives

1. To understand the concept of sustainability and sustainable development
2. To familiarize students with various environmental issues
3. To familiarize students with various Green Building Rating Systems
4. To understand selection criteria and implementation options for various green material
5. To inform the various alternatives materials and construction practices.
6. To inform the various recycled and innovative materials and construction techniques through case studies.

Course Outcomes

The student will be able to

1. evaluate the immerging trends in the fields of sustainable development and environment.
2. evaluate the effects of construction industry on environment.
3. understand the various evaluation systems for green buildings.
4. implement various green material selection and construction techniques.

5. determine immerging trends in alternative materials and construction techniques.
6. determine immerging trends in the field of recycled and innovative materials

UNIT - I (06 Hours)

Introduction to Sustainable Development

Basic Concepts of Sustainable Development - History of sustainable development in India and around the world –Sustainable Development an overview Bruntland Commission, UNFCCC – Goals of sustainable development – Energy, Environment and Financial sustainability.

UNIT - II (06 Hours)

Environment Management and Impact Assessment

Environment Management Basic: Introduction to biodiversity, Ecosystem and impacts of climate change on environment Environment Laws and Policies: EP Act (Environment Protection Act) Acts related to pollution and climate change Environment Impact Assessment: Introduction, goals and process of impact assessment

UNIT - III (06 Hours)

Sustainable Architecture and Green Buildings

Green Ratings System: in India and around the world- an introduction Green Rating Systems in India : LEED (IGBC), Griha – Ecohousing, BEE Rating – Codes and standards for Green Building.

UNIT - IV (06 Hours)

Green Building Materials and Construction Techniques

Introduction to Green materials – Life Cycle Analysis – Life Cycle Cost Analysis –Selection criteria of Materials and Construction Techniques Green Buildings.

UNIT - V (06 Hours)

Alternative Material and Construction Techniques:

Bamboo, ferrocrete, cob-adobe, etc and their construction techniques.

UNIT - VI (06 Hours)

Recycled and Innovative Materials and Construction Techniques

Recycled glass, plastic, recycled debris block. Process of manufacture and construction.

Assignments

1. Assignment on various building practices carried out conventionally and the consequences.
2. Assignment on Eco system and food chain,
3. Assignment on Environmental Impact.
4. Report writing on Green Material.
5. Report writing on Indoor Environmental Quality Enhancement facilities.
6. Case Studies
7. Assignment on Sustainable Development.

Text Books

1. Dominique Gauzin – Muller "Sustainable Architecture and Urbanism: Concepts, Technologies
2. Slessor, Eco-Tech : "Sustainable Architecture and High Technology", Thames and Hudson 1997.
3. Ken Yeang, "Ecodesign : A manual for Ecological Design", Wiley Academy, 2006.

Reference Books

1. Francis D.K. Ching, Ian M. Shapiro : "Green building Illustrated"
2. Kumar, Surender, Managi, Shunsuke: "The Economics of Sustainable Development The Case of India "

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

41 (G) : ELECTIVE-I:NUMERICAL METHODS IN CIVIL ENGINEERING

TEACHING SCHEME	CREDITS ALLOTTED
Theory: 3Hours / Week	Theory: 3 Credits

Course Pre-requisites

The Students should have knowledge of

1. Engineering Mathematics
2. Concept of differentiation and integration
3. Partial differential equations.

Course Objectives

To give a broad background to numerical methods common to various branches of civil engineering to the student.

Course Outcomes

The student will be able to

1. find out core concepts of error estimate and accuracy of numerical solutions.
2. use direct solutions of linear systems.
3. use iterative solutions of linear systems.
4. use direct solutions of non-linear systems.
5. use numerical solutions to solve partial differential equations.
6. use numerical integration methods to solve partial differential equations.

UNIT - I (6 Hours)

Introduction to Numerical Methods

Introduction, need of studying numerical methods,Sources of error in numerical solutions: truncation error, round off error.Order of accuracy - Taylor series expansion.

UNIT - II (6 Hours)

Direct Solutions of Linear Systems

Gauss elimination, Gauss Jordan elimination.Pivoting, inaccuracies due to pivoting.Factorization, Cholesky decomposition.

UNIT - III (6 Hours)

Iterative Solutions of Linear Systems

Jacobi iteration.Gauss Seidel iteration.Convergence criteria.

UNIT - IV (6 Hours)

Direct Solutions of Nonlinear Systems

Newton Raphson iterations to find roots of a 1D nonlinear equation.

Generalization to multiple dimensions.

Newton Iterations, Quasi Newton iterations.

Local and global minimum, rates of convergence, convergence criteria.

UNIT - V (6 Hours)

Numerical Methods to solve partial differential equations.

Difference operators (forward, backward and central difference), Stability and accuracy of solutions, Application of finite difference operators to solve initial and boundary value problems.

Numerical quadrature: Trapezoidal rule, simpsons rule, Gauss quadrature.

UNIT-VI (6Hours)

Numerical integration of time dependent partial differential equations

Parabolic equations: algorithms - stability, consistency and convergence, Lax equivalence theorem.Hyperbolic equations: algorithms - Newmark's method, stability and accuracy, convergence, multi-step methods.

Assignments: Any Six

1. Assignment problem based on ‘Gauss -Jordan Method’.
2. Assignment problem based on ‘Gauss -Elimination Method’.
3. Assignment problem based on ‘Gauss –Seidel Iteration Method’.
4. Assignment problem based on ‘Newton-Raphson Method’-1D solution.
5. Assignment problem based on ‘Newton –Raphson Method’-multidimensional solution.
6. Solution of Partial Differential Equation using ‘Trapezoidal Rule’.
7. Solution of Partial Differential Equation using ‘Simposon’s Rule’.
8. Solution of Partial Differential Equation using ‘Gauss Quadrature Rule’.
9. Solution of Time Dependent Partial Differential Equation .

Text Books

1. Balaguruswamy “ Numerical Methods” Tata Mcgraw Hill Publications
2. Dr.V.M.Domkundwar “Numerical Methods”
3. S.S.Sastry “Introductory Methods of Numerical Analysis”, Prentice Hall India

Reference Books

1. T.J.R.Hughes"The Finite Element Method", Prentice Hall, Englewood Cliffs, NJ, 1987.
2. I.Stakgold , “Green's functions and Boundary Value Problems", Wiley, 1998.
3. D.Dahlquist and A. Bork "Numerical Methods", Dan Prentice-Hall, Englewood Cliffs, NJ,. 1974.

Syllabus for Unit Test

Unit Test -1 UNIT – I,II,III

Unit Test -2 UNIT – IV,V,VI

42 : PROFESSIONAL SKILLS DEVELOPMENT (VI)

TEACHING SCHEME	CREDITS ALLOTED
Theory : 4 Hours / Week	Theory : 4 Credits

Course Pre-requisites

The Students should have knowledge of

1. Concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. A basic knowledge of Group Discussion, DO's and Don'ts done in the previous sem.
3. Basic knowledge of writing skills, importance of professionalism in emails and letters.
4. Knowledge on the concepts of criticism, feedback and conflicts.
5. Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6. Brief idea about professional and business meeting etiquettes.

Course Objectives

The Professional Skills Development 6 is an extension of PSD- 5 with focus on the remaining topics of Aptitude and Grammar. The further complex concepts of Permutation and Combination, Probability and grammatical topics such as prepositions etc would be dealt with. The objective here is to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-6 focuses on the other important aspects of soft skills training students such as techniques of effectively handling Personal Interviews during placement process and understand the dynamics of structured Resume and PIs

Course Outcomes

The student will be able to

1. Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn

remaining 25-30 rules of grammar topics such as prepositions, conjunctions etc relevant from the recruitment point of view.

2. Learn to handle vocabulary questions such as synonyms and analogies in recruitment test and other competitive exams
3. Understand and Learn techniques/Strategies of how to handle Personal interviews during recruitment process. Through Mock PIs students would be taught the appropriate ways of answering tricky questions in Interview and would learn the correct body language etc to be demonstrated in an interview process.
4. They would be acquainted with the differences between CV, Bio- Data and Resume and they would learn the correct format of a Résumé along with methods and styles to make their Resumes interesting.
5. Students would learn to incorporate various rules of written communication in business writing scenario with the appropriate tone and words.
6. Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector.

Unit I (24Hours)

Aptitude (Maths, Logical Reasoning, English)

- Maths
    - Permutation & Combinatiom
    - Probability
    - Maths Revision -1
    - Maths Revision - 2
- Logical Reasoning
    - Matching, Selection & Arrangement
    - Clocks & Calendars, Visual Reasoning
    - Input , Output & Flow Chart.

- Reasoning Revision- 1
- Reasoning Revision-2

- English
  - Grammar – III– (Prepositions& Conjunctions)
  - Grammar- (Articles & Parallelism)
  - Verbal Ability Revision- I

Unit II (24Hours)

Soft Skills & English Communication

- Resume-I
- Resume- II
- Mock GD
- Mock GD
- Personal Interviews-I
- Personal Interviews-II
- Mock PI
- Mock PI
- Extempore Speeches, Group Interviews
- Written Skills- Revision
- Stress Management
- Business Writing Tones.

Text Books

1. APAART: Verbal Ability
2. APAART: Logical Reasoning
3. APAART: Quantitative Aptitude
4. APAART: Speak Well 1 (English Language and Communication)
5. APAART: Speak Well 2 (Soft Skills)

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standards of Passing and ATKT Rules

1. For all courses, both UE (Universtiy Evaluation) and IA (Internal Assessment) constitue separate heads - of - passing (HoP). In ordar to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0 (40 % Marks) at UE and also a minimum grade point of 5.0 (40 % Marks) at IA.

OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50% Aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fail at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

1. A student is allowed to carry backlog of courses prescribed for B.Tech Sem - I, III, V, VII to B.Tech Sem - II, IV, VI, VIII respectively.
2. A student is allowed to keep term of Sem - III, if he/she is failing in any number of subjects of Sem I & II.
3. A student is allowed to keep term of Sem - V, if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem - I & II.
4. A student is allowed to keep term of Sem - VII, if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem - III & IV.

Award of Class for the Degree Considering CGPA

Award of Honours

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 ≤ CGPA ≤ 10.00	0	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks ≤ 80
8.00 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks ≤ 70
7.00 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks ≤ 60
6.00 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks ≤ 55
5.00 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks ≤ 50
CGPA Below 5.00	F	Fail	Marks Below 40

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BHARATI VIDYAPEETH DEEMED UNIVERSITY
Pune.

Faculty of Engineering & Technology
Programme : B. Tech. (Civil)

COURSE STRUCTURE AND SYLLABUS
(Choice Based Credit System - 2014 Course)
B. Tech. (Civil) – Sem VII & VIII

Bharati Vidyapeeth Deemed University, Pune

Bharati Vidyapeeth, the parent organization of this University is one of the largest educational organizations in the country. It has 171 educational units under its umbrella including 67 Colleges and Institutes of conventional and professional education.

The Department of Human Resource Development, Government of India on the recommendations of the University Grants Commission accorded the status of "Deemed to be University" initially to a cluster of 12 units of Bharati Vidyapeeth. Subsequently, 17 additional colleges / institutes were brought within the ambit of Bharati Vidyapeeth Deemed University wide various notifications of the Government of India. Bharati Vidyapeeth Deemed University commenced its functioning on 26th April, 1996.

Constituent Units of Bharati Vidyapeeth Deemed University

1. BVDU Medical College, Pune.
2. BVDU Dental College & Hospital, Pune
3. BVDU College of Ayurved, Pune
4. BVDU Homoeopathic Medical College, Pune
5. BVDU College of Nursing, Pune
6. BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
7. BVDU New Law College, Pune
8. BVDU Social Sciences Centre (M.S.W.), Pune
9. BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
10. BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
11. BVDU College of Physical Education, Pune.
12. BVDU Institute of Environment Education & Research, Pune
13. BVDU Institute of Management & Entrepreneurship Development, Pune
14. BVDU Poona College of Pharmacy, Pune
15. BVDU College of Engineering, Pune
16. BVDU Interactive Research School in Health Affairs (IRSHA), Pune
17. BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
18. BVDU College of Architecture, Pune
19. BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
20. BVDU Institute of Management, Kolhapur
21. BVDU Institute of Management & Rural Development administration, Sangli
22. BVDU Institute of Management & Research, New Delhi

23. BVDU Institute of Hotel Management & Catering Technology, Pune
24. BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
25. BVDU Medical College & Hospital, Sangli
26. BVDU Dental College & Hospital, Mumbai
27. BVDU Dental College & Hospital, Sangli
28. BVDU College of Nursing, Sangli
29. BVDU College of Nursing, Navi Mumbai

The status of University was given to a cluster of these colleges and institutes in appreciation of the high level of their academic excellence and for their potential for further growth.

During the last 20 years or so, the University has achieved higher pinnacles of academic excellence and has established its reputation to such an extent that it attracts students not only from various parts of India but also from abroad. According to a survey conducted by Association of Indian Universities, this University is one among the top ten Universities in the country preferred by the overseas students for admissions. At present, there are more than 850 overseas students from 47 countries on the rolls of constituent units of this University.

During the last 20 years, there has been tremendous academic expansion of the University. It now conducts in all 305 courses in its constituent units, of them 108 are Post Graduate, 45 are Under Graduate and 55 Diploma level courses. 12 Fellowship and 5 certificate courses. All the professional courses which the University conducts such as those of Medicine, Dentistry, Engineering etc., have approval of the respective statutory councils, viz., Medical Council of India, Dental Council of India, All India Council for Technical Education etc.

The University is a throbbing center of research activities and has launched Ph.D. programmes in 77 subjects and M.Phil in 3 subjects. It has also introduced quite few innovative academic programmes such as Masters in Clinical Optometry, M.Tech. in Nano Technology etc.

The University's performance and achievements were assessed by the "National Assessment and Accreditation Council" and it was reaccredited with a prestigious "A" grade in 2011. Some programmes of the constituent units such as College of Engineering at Pune, Management Institute in Delhi and others have also been accredited by "National Board of Accreditation". Three constituent units of Bharati Vidyapeeth Deemed University are also the recipients of ISO 9001-2001 certifications.

College Information :

Bharati Vidyapeeth University College of Engineering, Pune (BVUCOE) established in 1983, a constituent unit of BVU (University with 'A' Grade status by MHRD, accredited to Grade 'A' by NAAC in 2004 and 2011) and holds a place of pride and is amongst the most reputed institute. It has been ranked to 61st by National Institutional Ranking Framework (NIRF) with criteriawise ranking as 5th in Graduate Outcome (GO), 13th in Outreach and Inclusivity (OI), 44th in Teaching Learning Resources (TLR) and 62nd in Perception (PR). This also made institute to stand 4th in the State of Maharashtra. Further, DATAQUEST-CMR national survey also ranked this institute to 4th among private technical institutions of India, 29th by Times of India and 41st by OUTLOOK. This is the only institute selected by MHRD for its Technical Education Quality Improvement Programme (TEQIP-II – 1.1 Programme) for the grant of Rs. 4 Crores.

BVUCOE, Pune offers 09 graduate, 08 post graduates programmes and Doctoral programmes in 08 disciplines. All Programmes are accredited by National Board of Accreditation (NBA) twice and we have applied for third cycle of accreditation.

Institute has its own spacious well designed building measuring 26,286 sq. m. and it houses 101 labs, 43 class rooms, and 21 tutorial rooms. The library of the institute is a five storied building and houses periodical section, computer center, reading hall, reference section. It contents more than 60,000 books, 15,000 volumes, 80 national and 81 international journals subscription and digital library facility. Digital library of institute with 66,944 number of journals in e-form is one of the richest source of knowledge in e-form for students and faculty members. The Library, Laboratories, Equipments, Learning resources and Software constantly get upgraded and updated in tune with the changing time. An Investment of Rs.119.95 million is made in the last five years.

The structured faculty development programme has strengthened quality of Teaching - Learning Process in the institute. 35 faculty members with Ph. D. qualifications have been proved as resources for research, innovations and sound Teaching – Learning Process. As a part of quality improvement programme 04 number faculty members were deputed to International Universities, Institutions of national importance such as IIT, NIT etc. for qualification improvement. Team of 206 faculty members with average experience 11.7 years and average age 38.3 years indicates teachers with fine blend of experience and youth. Faculty members are well conversant and trained for use of latest softwares and latest equipments being purchased every year as policy of upgrading laboratories. In last five years college has invested Rs. 119.95 million in laboratory upgradation. Institute organized 138 number of continuing education programmes in last five years to keep sharpen skills of faculty members. Further, 1389 faculty members were deputed to attend various workshops and training programmes for sharing and enhancing their knowledge. Faculty members also play active role in curriculum development as Member of Board of Studies of various subjects and other statutory bodies of the University.

The research quality is indicative of the university penchant for quality. The research publications in reputed international and national refereed journals and conferences have shown a steady and significant rise over the years which is aptly reflected by 1091 Research papers publications in reputed national and international journals in last five years. Grant

of Rs. 152.73 Lakhs from funding agencies such as UGC, DST, DRDO, AICTE etc. fetched by faculty members is strong indicator of research aptitude of faculty members. Seed money up to Rs. 3 lakhs under Institutionally Funded Research Programme (IFRP) nurtures research aptitude of faculty members. 575 number of publications in standard research databases such as SCOPUS, Web of Science, Google Scholar etc. in last five years throws light on quality of publications by faculty members of this institute. These publications by faculty members have received 137 number of citations in the same period. Institute has 02 patents to its credit and filed 05 patents.

The institute has collaboration with international universities such as North Carolina A & T State University, Greensboro, USA, Joint School of Nanoscience and Nanoengineering (JSNN), USA, The University of Tokushima, Japan, ARM University, USA and with industries such as TCS, SKF India Ltd. Every year one faculty member is deputed for Ph. D. programme in NCAT with scholarship. Students of M. Tech. (Nanotechnology) joins JSNN, USA to pursue their dissertation research work for six months with scholarship to the tune of $1000 per month. Further, NCAT, USA, The University of Tokushima, Japan contributes intellectually as well as financially to organize biannual international conference NANOCON. Three editions of NANOCON are conducted since 2010 with their association. In association with Eduvance & GAATsis, a " Center of Excellence in Embedded Systems" is established in the Institute with donation of Educational kits like ARM development boards from ARM University Program and PSoC kits by Cypress Semiconductors are used for developing projects in the sponsored laboratory. TCS supports students and faculty members for faculty enablement programmes and student development programme. Establishment of Lubricant Conditioning Monitoring Laboratory is outcome of collaboration with SKF India Ltd.

Being Deemed University college takes advantage of academic autonomy in making the curriculum industry oriented and enable students to make employable. In-plant training (45 days), courses such as Professional Skill Development introduced as integrated part of course structure. In-plant training enable students to interact within their associated industries for gaining practical field experience and professional exposure. Curriculum is Choice Based Credit System which makes students path of joining international universities for their higher studies smoother.

Today, qualitative soft skill development in students is more pertinent to a student's professional career. The institute regularly arranges training programme in the area of personality development, aptitude test, group discussion and personal interview. Through its Employment Enhancement Programme (EEP) designed for third year students which comprises of communication skill quantities analysis, corporate culture, IT Training and soft skills. This programme is conducted in association with professional institutes of national repute for effective execution and implementation. To enhance their professional experience and get them head start in the industry, an innovative programme is initiated on student mentoring "Saturday @ BV", wherein speakers are entrepreneurs and high ranked corporate who share their experiences, hardship and their corporate journey.

In it's long, multi-pronged, persistent and pain staking efforts for producing quality engineering professionals, institute has produced more than 1068 entrepreneurs.

PROGRAMME : CIVIL ENGINEERING

Mission and Vision of the Institution:

Vision:

- To Be World Class Institute for Social Transformation Through Dynamic Education

Mission:

- To provide quality technical education with advanced equipments, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conductive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

Mission and Vision of the Department
Department of Civil Engineering:
Vision:

To create Civil Engineers who will transform Civil Engineering Industry for sustainable development of society.

Mission:

- To create Civil Engineers enriched with quality technical education.
- To inculcate innovation, creativity and research approach among the graduants.
- To create entrepreneurs practicing professional ethics.

Programme Educational Objectives

PEO1: To prepare students for career in Civil Engineering profession.

PEO2: To develop a responsible 'Entrepreneur'.

PEO3: To develop the student to cope up with the advancements in Civil Engineering.

Programme Outcomes

The Graduates will be able to

1. apply possessed knowledge of fundamental subjects to Civil Engineering problems.
2. analyze Civil Engineering problems.
3. design Civil Engineering structures with appropriate consideration to safety, economy, health and environmental considerations.
4. solve complex Civil Engineering problems by conducting investigations.
5. use modern Civil Engineering tools, techniques and software.
6. apply their professional responsibilities.
7. understand the impact of professional Engineering solutions in societal and environmental contexts.
8. exhibit professional ethics and norms of Engineering practice.
9. function individually and in teamwork.
10. communicate effectively in both verbal and written forms.
11. manage the work and finance of a Civil Engineering projects.
12. practice the use of lifelong learning.

BHARATI VIDYAPEETH UNIVERSITY, PUNE
FACULTY OF ENGINEERING and TECHNOLOGY

Programme: B. Tech. (Civil) Sem VII - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme - Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
43	Structural Design - III*	3	2	-	60	20	10	10	50	--	150	3	1	4
44	Environmental Engineering II -	3	2	--	60	20	10	10	50	--	150	3	1	4
45	Foundation Engineering	3	-	--	60	20	10	10	--	---	100	3	-	3
46	Urban Planning	3	-	--	60	20	10	10	--	---	100	3	-	3
47	Elective-II	3	--	--	60	20	10	10	---	---	100	3	--	3
48	Computer Applications in Civil Engineering - IV	--	2	-	--	--	-	---	50	--	50	--	1	1
49	Project Stage I -	--	2	--	-	-	-	-	50	---	50	--	4	4
50	In plant Training for 45 days	--	--	--	--	--	--	--	50	---	50	--	3	3
	Total	**15**	**12**	**-**	**300**	**100**	**50**	**50**	**250**	**00**	**750**	**15**	**10**	**25**

*End Sem Exam of duration 4 hours.

Sr. No.	41 Elective –I (Sem VI)	Sr. No.	47 Elective II (Sem VII)
41 A	Financial Management	47A	Construction Management
41 B	Advanced Structural Analysis	47B	Maintenance & Rehabilitation of the Structures
41 C	Urban Water Management	47C	Environmental Impact Assessment
41 D	Docks, Ports and Harbours	47D	Bridge and Tunnel Engineering
41 E	Human Resource Management	47E	Ground Water Hydrology
41 F	Green Construction Practices	47F	Geo informatics
41 G	Numerical Methods in Civil Engineering	47G	Advances in Concrete technology & Composites

*End Sem Exam of duration 4 hours.

BHARATI VIDYAPEETH UNIVERSITY, PUNE
FACULTY OF ENGINEERING and TECHNOLOGY

Programme: B. Tech. (Civil) Sem VIII - 2014 Course

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme - Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW& Practical	Total	Theory	TW	Total
51	Earthquake Resistant Design of Structures	3	2	--	60	20	10	10	50	--	150	3	1	4
52	Water Resources Engineering	3	2	1	60	20	10	10	--	50	150	4	1	5
53	Infrastructure Engineering	3	2	-	60	20	10	10	50	---	150	3	1	4
54	Elective-III	3	2	--	60	20	10	10	50	---	150	3	1	4
55	Project Stage-II	--	6	--	--	-	--	--	150	----	150	--	8	8
	Total	**12**	**14**	**1**	**240**	**80**	**40**	**40**	**300**	**50**	**750**	**13**	**12**	**25**

Total Credits

Semester-VII = 25

Semester-VIII = 25 **Grand Total = 50** **Total Credits from Sem-I to Sem-VIII= 200**

Total Credits from Sem - I to Sem-VIII= 200

Sr. No.	54 Elective-III (Sem VIII)
54A	Disaster Management
54B	Advanced Steel Design
54C	Solid Waste Management
54D	Entrepreneurship Development
54E	Hydraulic Structures
54F	Social and Legal Aspects in Civil Engineering
54G	Advanced Engineering Geology with Rock Mechanics
54 H	Development Engineering

Total Credits
Semester -VII = 25
Semester -VIII = 25
Grand Total = 50

Total Credits from Sem - I to Sem-VIII= 200

PROGRAMME: B. TECH. CIVIL

Reasons for Revision:

1. Letter from Secretary, University Grants Commission, New Delhi (D. O. No. F 14-12/2016(CPP II) dated 13th June 2016) Action:
   a. Addition of new course Urban Planning at B. Tech. Civil Sem VII
   b. Subsequent removal of Elective II of B. Tech. Civil Sem VII
   c. Adjustment of the courses of Elective II in Elective III (Sem VII) and Elective IV (Sem VIII).
   d. Renaming of Elective III and Elective IV as Elective II (Sem VII) and Elective III (Sem VIII) respectively.
2. Subject Environmental Studies shifted from Sem VIII to Sem VI.

43: STRUCTURAL DESIGN-III

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites

The Students should have knowledge of

1. conditions of equilibrium, plotting Shear force and bending moment diagram of beams with various support conditions and various load combinations.
2. Determination of bending stress and shear stress in beams,Concept of short, long columns, direct and bending stress, principal stress and strains.
3. Concrete, concreting techniques and properties of concrete
4. Design a R.C.C. slabs, beams, columns and footings as per limit state method
5. Concepts of Working Stress Method and design of singly reinforced beam by working stress method.

Course Objectives:

The students should be able to design advanced structures in Reinforced Cement Concrete and in Prestressed Concrete.

Course Outcomes:

On completion of the course, the students will be able to:

1. differentiate between prestressed concrete and reinforced concrete, analyse a prestressed concrete beam, draw the stress distribution diagrams at initial and final stages of loading and know the various methods of prestressing.

2. calculate various losses due to prestressing, design a simply supported prestressed concrete beam (rectangular , symmetrical and unsymmetrical flanged beam) for flexure ,shear and deflection.
3. design and detailing of flat slab using I.S. code method
4. design and detailing a T and L shaped cantilever retaining wall for various loading conditions.
5. design and detailing of a rectangular combined footing for two columns, beam-slab type.
6. design the circular water tanks resting on ground using I.S. code method, design of rectangular tanks using I.S. code method

UNIT - I (06Hours)

Introduction to Prestressed Concrete Structures

Introduction to prestressing, Basic definitions and terms related to pre stressing, Concepts of prestressing, Materials used, Various methods of prestressing, analysis of P.S.C. beam for flexure.

UNIT - II (06Hours)

Losses and Design of P.S.C.beam

Concept of losses, Calculation of various losses.

Design of Pre stressed simply supported beams of rectangular and flanged cross sections , design for flexure and shear only , check for deflection, Design should confirm to the latest version of I.S. 1343

UNIT - III (06Hours)

Design of Flat Slabs

Concept of flat slabs ,Design of flat slabs using latest I.S. Codes

UNIT - IV (06Hours)

Design of Retaining walls

Design of cantilever retaining walls –T and L-shaped for all loads as per latest I.S. codes.

UNIT - V (06Hours)

Design of Combined Footing

Design of slab type rectangular combined footing for two columns only. Concept of beam- slab type footing.

UNIT - VI (06 Hours)

Design of Water Tanks

Design of containers only , resting on ground.Use of latest version of I.S. 3370

Circular tanks - using I.S. code method.

Design of rectangular water tanks using I.S.Code method

Assignments:

Any six from the list given below.

1. Assignment problems based on analysis of rectangular P.S.C.beam
2. Assignment problems based on analysis of unsymmetrical I section of a P.S.C.beam
3. Assignment problems based on analysis of T section of a P.S.C.beam
4. Assignment problems based on time dependent losses in prestressing
5. Assignment problems based on instantaneous losses in prestressing
6. Assignment problems based on design of a rectangular prestressed concrete beam.
7. Assignment problems based on design of a flat slabs.
8. Assignment problems based on design of L-shaped retaining wall.
9. Assignment problems based on design of circular water tank using I.S.Code method.
10. Assignment problems based on design of rectangular water tank using I.S. Code method.

Term Work:

1. Termwork should be based on above syllabus.
2. Termwork should consist of three projects on above syllabus.
3. Minimum three half imperial sheets based on above projects to be drawn.

Text Books:

1. Dr. V. L. Shah and Dr. S. R. Karve- "Limit State Theory and Design", Pune VidyarthiGriha Publications
2. Punmia, Jain and Jain, "Comprehensive Design of R. C. Structures", Standard Book House
3. Sinha R.C."RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi
4. Ramamrutham " Design of R. C. Structures '- Dhanpat Rai Publications
5. Krishna raju " Advanced Design of Structures"

Reference Books:

1. T.Y.Lin " Design of P.S.C structures"
2. S. S. Bhavikatti, "Advanced R.C.C. Design", New Age International Ltd.
3. N.Subramanian" Design of Reinforced Concrete Structures" Oxford University Press
4. S.Unnikrishnan Pillai,Devidas Menon "Reinforced Concrete Design"- Tata Mcgraw Hill Companies
5. P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

44: ENVIRONMENTAL ENGINEERING II

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites

The Students should have knowledge of

1. Engineering Chemistry
2. Engineering Mathematics
3. Mechanics of fluids

Course Objectives:

To make student understand

1. Hydraulic design of sewers and storm water.
2. Principle and Design of Sewage Treatment Plant.
3. The characteristics of wastewater (domestic as well as industrial).
4. The effect of wastewater discharge (domestic as well as industrial) into the environment in uncontrolled fashion.
5. The difference between requirement of rural area and urban area for water and waste water management.

Course Outcomes:

On completion of the course, the students will be able to:

1. Use the concept related to sewage, sewer, storm water etc in its hydraulic design
2. Study and design of Primary treatment units.
3. To test the sample of waste water in the laboratory for physical & chemical characteristics.
4. Take-up functional planning, layout and design of sewage treatment plant components.
5. Analyze the industrial waste water for its treatment units
6. Plan for rural sanitation provisions, perform functional design of septic tank

UNIT - I (06 Hours)

Collection and Conveyance of sewage

General Aspects of Environmental Engineering – Study of waste water, black water & grey water.

System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems.

Quantity of storm water and sanitary waste water Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade)

UNIT - II (06 Hours)

Characteristics and Primary Treatment of Sewage

Characteristics of sewage – Physical, Chemical, Biological.

Introduction to unit operations and processes.

Primary Treatment –Preliminary and Primary treatment- screen chamber, grit chamber, oil & grease removal, Primary settling tank.(including design of screen chamber, grit chamber, primary settling tank)

UNIT - III (06 Hours)

Secondary Treatment of Sewage and disposal of sewage

Secondary Treatment-Activated sludge process: Theory and design of ASP, sludge volume index, sludge bulking & control, modifications in ASP.

Trickling filter: Biological principle, different T.F. media & their characteristics, design of standard rate and high rate filters, single stage & two stage filters, recirculation, ventilation, operational problems, control measures.

Introduction to the process of sequencing batch reactor (SBR) and membrane bioreactor (MBR).

Disposal of sewage: Methods and effluent standards for disposal

UNIT - IV (06 Hours)

Treatment and Anaerobic Digestion of Sludge

Principles of anaerobic digestion, stages of digestion, bio-gas production, its characteristics and application, factors governing anaerobic digestion, Design of high rate digester, Theory, Process and design of sludge drying bed. Advances in sludge treatment and disposal.

UNIT - V (06 Hours)

Industrial Waste Water treatment

Industrial waste water treatment: Methods of sampling, Equalization and neutralization. Application of preliminary, primary and secondary treatment for industrial wastewater as per the CPCB norms. Sources of waste water generation from manufacturing process, characteristics of effluent, different methods of treatment & disposal of effluent for the following industries: Sugar, dairy and Pulp & Paper. Effluent Discharge standards as per CPCB norms. Introduction to concept of CETP (Common Effluent Treatment Plant.)

UNIT - VI (06 Hours)

Rural Sanitation

Rural sanitation: Importance of Rural sanitation, bio-gas recovery. Septic tank including soak pit. Waste water recycling and reuse- Definition of terms used in water reuse applications, Role of water recycling in Hydrological Cycle, Waste water reuse application, need for water reuse, Public Health and Environmental issues in reuse of treated waste water, Two Pit Latrines.

Assignments:

1. Numericals on Hydraulic Design of Sewer
2. Characteristics of sewage sample collected by the students.
3. Numericals on Design of standard rate and high rate filters
4. Collection of information - Advances in sludge treatment and disposal.
5. Drawing Layout of ETP of Sugar, Pulp and Paper, Dairy Industries (Case studies)
6. Numericals on Design and drawing of septic tank for hostel
7. Information of useful micro-organisms in waste water treatment
8. Case studies – Recycle and reuse of treated waste water.
9. Case studies - Rural sanitation. (Site Visit).

Term Work:

First five experiments compulsory and any three from remaining six.

1. Determination of Solids -Total solids, suspended solids, volatile solids, settleable solids & nonsettleable solids, Total Dissolved solids, Fixed Solids.
2. Determination of Dissolved oxygen
3. Determination of Bio-Chemical Oxygen Demand
4. Determination of Chemical Oxygen Demand

5. Determination of Electrical Conductivity of waste water samples
6. Determination of Phosphates from waste water samples by spectrophotometer
7. Determination of Nitrates from waste water samples by spectrophotometer
8. Determination of heavy metals from waste water samples like Cr6+ or Zn or Ni or Cd
9. Determination of total nitrogen from waste water samples by Kjeldhal method
10. Visit to domestic / Industrial wastewater treatment plant & its detailed reports
11. Computer aided design of Sewage Treatment Plant (STP) OR Effluent Treatment Plant (ETP) of Sugar or Dairy Industry using suitable software (C programming or any other suitable software)

    Note: -Term Work should include a detailed analysis of practical interpretation, significance and application of test results

Text Books:

1. Waste Water Treatment & Disposal – Metcalf & Eddy – TMH publication
2. Environmental Engg. – Peavy, Rowe – McGraw Hill Publication.
3. Environmental studies by Rajgopalan- Oxford University Press
4. Waste Water Engg. – B.C. Punmia & Ashok Jain – Arihant Publications
5. Sewage Disposal & Air Pollution Engg. – S. K. Garg – Khanna Publication
6. Industrial Waste Water Treatment- A. D. Patwardhan Publication – PHL Learning Private Limited.
7. Water Supply And Wastewater Engineering – B S N Raju- McGraw Hill Publication.
8. Waste Treatment Plants-C. A. Sastry Narosa Punlication
9. CPHEEO Manual on sewage treatment

Reference Books:

1. Environmental Engg. – Davis - McGraw Hill Publication
2. Water Supply & Waste Water Engg.- B.S.N. Raju – TMH publication
3. Resources i) http://nptel.iitm.ac.in/courses-contents/IIT Kanpur and IIT Madras. ii) http://cpcb.nic .in iii) http://moef.nic .in

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

45: Foundation Engineering

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites

The Students should have knowledge of

1. building construction
2. geotechnical engineering
3. engineering mechanics

Course Objectives:

Student can apply the knowledge to design different types of foundations.

Course Outcomes:

On completion of the course, the students will be able to:

1. carryout soil exploration.
2. find out bearing capacity of soil
3. apply knowledge of consolidation to foundation design..
4. design pile foundation
5. analyze sheet pile foundation
6. apply methods of soil stabilization.

UNIT - I (6 Hours)

Soil Exploration

Purpose and planning of exploration programme. Subsurface exploration, Trial pits, Methods of borings. Provisions as regards Number of bore holes and depth of boring and spacing as per IS. Geophysical method-Seismic reflection method and Electrical resistivity method. Coring of rocks, preparation of bore logs and core logs subsurface exploration report. Disturbed and undisturbed samples. Types of samplers. Field testing-SPT, DCPT, and its correlation IS Code provisions.

UNIT - II (6 Hours)

Bearing Capacity

Modes of shear failure. Terzaghi's bearing capacity analysis and Bearing capacity factors. Skempton method for Strip, Rectangular and Circular footings. Effect of water table and depth on bearing capacity. Bearing capacity of layered soil. Effect of eccentricity. Use of SPT blow count and I.S. provisions. Plate Load Test, Floating foundation. Foundations on rocks, various field and laboratory tests on rocks for deciding SBC.

UNIT - III (6 Hours)

Elastic settlement and Consolidation

Pressure bulb, Contact pressure, Elastic settlement of bases (Elastic Mechanism and Janbu's Method). I.S. criteria, Total and Differential settlement, Tolerable settlement, Allowable soil pressure. Effect of lowering of water table

Consolidation Settlement: Introduction, Spring analogy, Terzaghi's consolidation theory, Laboratory consolidation test, Determination of coefficient of consolidation by Square root of time fitting method and Logarithm of time fitting method. Time factor, Rate of settlement and its applications in shallow foundation. Normal consolidation, over consolidation and preconsolidation pressure.

UNIT - IV (6 Hours)

Pile Foundation

Introduction, Pile classification, Pile installation-Cast in situ, Driven pile. Load carrying capacity of pile by static method, Dynamic methods Engineering News formula, Modified ENR formula. Pile load test and Cyclic and dynamic pile load test. Group action-Feld rule, Rigid block method. Negative skin friction. Settlement of pile group in cohesive soil by approximate method. Micro piles. Socketing of piles in rocks

UNIT - V (6 Hours)

Sheet Piles and foundation on black cotton Soil

Sheet Piles Strutting for excavations, Pressure distribution diagram. Cantilever sheet pile, Anchored sheet pile. Free earth support and Fixed earth support.

Foundations on Black Cotton Soil.: Characteristics of black Cotton Soils, Problems and preventive measures Swelling potential, Under reamed piles – Design Principles and Techniques (Maximum two bulbs). Prefabricated vertical drains and Preloading Technique.

UNIT - VI (6 Hours)

Geosynthetics and Soil Stabilization.

Geosynthetics -Types, Properties, Functions, Reinforcement concept. Reinforced soil structures with vertical faces, Reinforced soil embankments, Methods of soil stabilization. stone columns, compaction piles.

Assignments:

1. A case study for Preparation of bore hole investigation report
2. Numericals on Bearing Capacity by different Methods.
3. Numericals on Plate load test.
4. Numericals on Consolidation of soil.
5. Numericals on Elastic settlement by different methods.
6. Explain Pile load test.
7. Discuss Group action of piles and Negative skin friction.
8. Draw sketches of .Under reamed pile .
9. Sheet pile and its applications.
10. Methods of soil stabilization.

Text Books:

1. C.Venkatramaia, "Geotechnical Engineering", New Age International Publication.
2. B.C.Punmia. "Soil mechanics and foundation Engineering", Standard Publishers and distributers.
3 K.R.Arora, "Soil mechanics and foundation Engineering", Standard Publishers and distributers.

Reference Books:

1. Braja M.Das. "Foundation Engineering". Centage Learning India Pvt. Ltd.

2. B. N.D.Narsinga Rao. Soil mechanics and foundation Engineering" ,Wiley India Pvt Ltd.
3. Tomlinson, "Foundation Engineering ",Longman Book Ltd. Harlow
4. Joseph E. Bowels, "Foundation Engineering ",Mc.Graw Hill International
5. Donald P. Coduto "Foundation Design Principles and Practices", Pearson Publication.
6. Gopalrajan "Basic and Applied Soil Mechanics ", New Age International Publication
7. Gulati and Manoj Datta "Geotechnical and Foundation Engineering", Mc.Graw Hill International

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

46: URBAN PLANNING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: Credits 3
	Continuous Assessment: 40 Marks	

Course Pre-requisites

The Students should have knowledge of

1. Building Planning and Design
2. Building Bye laws and Development control rules.
3. Infrastructure Engineering.

Course Objectives:

Students will study concept & process of Urban Planning.

Course Outcomes:

On completion of the course, the students will be able to:

1. understand rationale of Town planning
2. learn theory of Urban planning
3. understand concept of smart city planning.
4. learn process of making development plan as per MRTP Act 1966
5. know Intelligent Transport system.
6. Describe spatial aspects of planning.

UNIT - I (6 Hours)

Rationale of planning

Definitions and Rationales of Planning ; Goals and objectives of planning; Components of planning; Benefits of planning;

Foundations of Planning; Sustainability and rationality in planning; Components of sustainable urban and regional development; various sources of planning knowledge, various forms of planning knowledge; Reasoning and its various forms in planning; Space, place and location

UNIT - II (6 Hours)

Theory of Urban Planning

Scope, purpose and methods of Planning, the nature and purpose of Town and Country Planning at National, Regional and local levels.

The physical planning process and the relation between surveys and plan.

Land-use planning, determinants of Land Use and of spatial patterns of urban land uses, Various surveys for physical planning and techniques of Analysis realization of the plan. The parts of the town and their relationship, planning standards, site layout and development, zoning and density control.

UNIT - III (6 Hours)

Various types of Plans

Development Plans and Development Regulations Definition of development plan; Types of development plans: master plan, city development plan, structure plan, district plan, action area plan, subject plan, town planning scheme, regional plan, sub-regional plan; Planning Advisory Group report and the URDPFI Guidelines; Provisions of MRTP Act 1966; Defining development and development control regulations, types of development control; Implications of violations of development control regulations;

UNIT - IV (6 Hours)

Smart City Planning

Concept of Smart City; Urban renewal, retrofitting and redevelopment program. Economic growth model of a city. Capacity building in urban administration and urban planning.

Smart city planning for solid waste management, rejuvenation of streams and rivers, affordable housing to poor ,housing and slum redevelopment, energy efficient and green buildings, Water supply and its management, Concept of intelligent transport network and green belts. E governance and citizen's participation.

UNIT - V (6 Hours)

Traffic and Transportation

Concept of PCU and level of service, capacity of uninterrupted flow conditions, factors affecting; capacity and level of service; capacity of rural and urban roads, capacity at intersections.

Traffic Volume Count, origin destination survey, speed and delay study, parking surveys, road network inventory, accident study - need, design of survey proforma, methods of conducting surveys, analysis and interpretation; Concept of transport facility design.

UNIT - VI (6 Hours)

Spatial Aspects

Settlements–rural and urban settlements in their regional setting hinterlands. Towns and cities their geographical characteristics.

Urban concentrations and growth characteristics factors, historical, administrative, location, economic, socio-economic consequences. The essential characteristics of city/town, importance of morphological aspects in town planning.

Use of remote sensing and GIS in planning.

Assignments:

1. Report on UDPFI guidelines for urban planning
2. Settlements and their physical forms during various dynasties upto 18th century and during colonization
3. Study of various surveys for Urban planning.
4. Write a report on preparation of development plan of a City
5. Case studies on Urban planning from ITPI Journal.
6. Applications of Remote sensing and GIS in Urban planning
7. Land use Survey of a given area
8. Layout of neighborhood design
9. Traffic volume survey at a given intersection

Text Books:

1. L.R. Kadiyali, " Traffic Engineering and Transport Planning" Khanna Publishers, New Delhi, 2007
2. Annapurna Shaw ," Indian cities " Oxford India ,2012
3. B. Gallion, S. Eisner , "The Urban Pattern", Van Nostrand Reinhold Company,2003
4. ITPI, " City and Metropolitan Planning & Design" ITPI, New Delhi

Reference Books:

Peter Hall, "Urban and Regional Planning" Routledge, New York, 2002

Smart City Guidelines, Ministry of Urban Development, Govt. of India. 2015

NCRPB, "Regional Plan 2021, New Delhi, 2005

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 A: CONSTRUCTION MANAGEMENT

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites

The Students should have knowledge of

1. Building Construction,
2. Building planning design and byelaws.
3. Engineering Project Management.

Course Objectives:

Student can apply the knowledge of Construction Management during execution of civil engineering structures.

Course Outcomes:

On completion of the course, the students will be able to:

1. Know role, duties and responsibilities of construction manager.
2. Carryout economic comparison of project
3. Apply knowledge of linear programming to civil engineering problems.
4. Carryout feasibility analysis
5. Apply different laws to construction industry
6. Prepare site layout.

UNIT - I (6 Hours)

Title- Construction Sector

Nature, Characteristics, Size and Structure of construction sector in India. Role in economic development of Nation ,Employment Generation, Infrastructure Development, CIDC's role in Gearing up Construction sector. Features of construction economy.

Construction Management Role , importance ,,necessity , characteristics and functions of construction management Role ,Qualities, Ethics, Duties, Authorities, Responsibilities and Training of Construction Managers'

UNIT - II (6 Hours)

Title -Engineering Economics

a) Time value of money, Cash flow diagram. Meaning and necessity of Economics, types of costs, interest- simple, compound,

b) Economic comparisons of projects- Discounting Methods net present worth method, benefit cost ratio method, internal rate of return method.

UNIT - III (6 Hours)

Linear Programming

Transportation and Assignment Models, Game theory, Pure and Mixed strategy.

UNIT - IV (6 Hours)

Artificial Intelligence in Construction Management

Introduction to Artificial Neural Network, Fuzzy logic and Building information modeling

UNIT - V (6 Hours)

Construction Labour and Legislation

Necessity and importance of labour laws, Law of Contract, Contract labour Act, 1970,Worksman compensation Act 1923, Child labour Act, Building and construction Act, Employees Provident fund Act , Payment of wages Act, Minimum wages Act. Industrial Disputes Act

UNIT - VI (6 Hours)

Construction Safety Management

a) Causes of Accidents, Safety measures and policy adopted, Safety Parameters, safety requirements, Personal Protective Equipments. Role of various parties in safety management, safety benefits to employers, employees and customers

b) Site Layout:- Factors Affecting site layouts, Typical Layout for major Civil Engineering Project.

Assignments:

1. Preparation of Site layout.
2. Numerical on Time Value of Money.
3. Application of LPP for civil engg. Problems
4. Preparation of feasibility report –A case study.
5. Study of labour laws
6. Case study on safety Management.

Text Books:

1. S. Seetaraman Construction Engineering and Management Umesh Publications Delhi.
2. L.C.Jhamb volume I, Quantitative Techniques for Managerial Decisions. Everest Publishing House Pune

Reference Books:

1. K.K.Chitkara, Construction Project Management, Tata McGrawHill Education Pvt. Ltd. New Delhi.
2. Edward R. Fisk, Construction Project Administration, Prentice Hall New Jersy Colombus ohio.
3. O.P.Khanna, Industrial Engineering and Management, Dhanpatrai Publications New Delhi.
4. Barrie Paulsion, Professional Construction Management, Tata McGrawHill Education Pvt. Ltd. New Delhi.
5. Sengupta, Construction Planning and Management. McGrawHill Education Pvt. Ltd. New Delhi.

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

47 B : MAINTENANCE & REHABILITATION OF STRUCTURES

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites

The Students should have knowledge of

1. Building construction, various techniques of plastering, pointing and concreting
2. Concrete technology
3. Properties of R.C. members in flexure.

Course Objectives:

The student should be able to use suitable materials and techniques for repair.

Course Outcomes:

On completion of the course, the students will be able to:

1. identify need of maintenance and repair of structure.
2. identify Preventive measures
3. identify suitable method for evaluating structure.
4. select suitable material for repair .
5. select suitable techniques for repair
6. prepare report on repair & rehabilitation work.

UNIT - I (06Hours)

Introduction

Properties of concrete - Strength, Permeability, Durability, Stiffness, Ductility, Thermal properties & Cracking. Maintenance, Repair, Strengthening and Retrofitting of structure

UNIT - II (06Hours)

Preventive measures and Maintenance

Effect of climate, temperature, chemicals, wear and erosion, Design and construction errors, Corrosion mechanism, Effect of cover, thickness and cracking, method of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and catholic protection, Maintenance, repair and rehabilitation, Facets of Maintenance importance of Maintenance Preventive measures on various aspects.

UNIT - III (06 Hours)

Non Destructive Testing and Structural Audit

Inspection, Causes of deterioration, Non destructive testing methods and testing techniques, Assessment procedure for evaluating a damaged structure, Structural Audit and its report.

UNIT - IV (06 Hours)

Materials for Repair and Retrofitting

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, Sulphur infiltrated concrete, ferro-cement, fibre reinforced concrete, Rust eliminators and polymers coating for rebars, foamed concrete, mortar and dry pack, vacuum concrete, Mortar repair for cracks, shoring and under pinning.

UNIT - V (06 Hours)

Techniques for Repair and Retrofitting

Selection of suitable material, Technique to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering wear, Gunite and Shotcrete, Epoxy injection, fire, leakage, marine exposure.

UNIT - VI (06 Hours)

Case Study on Repair & Rehabilitation of structure.

Case study report on Maintenance repair & Rehabilitation of a structure.

Assignments:

1. Assignment based on properties of concrete.
2. Assignment based on need of maintenance and repair
3. Assignment based on Preventive measures
4. Assignment based on maintenance
5. Assignment based on Non destructive testing
6. Assignment based on Structural Audit and its report
7. Assignment based on various materials for repair.
8. Assignment based on market survey of various materials for repair.
9. Assignment based on various techniques of repair.

Text Books:

1. M.S.Shetty, "Concrete Technology – Theory and Practice", S . Chand & Company, New Delhi, 1992.
2. Denison Campbell, Allen and Harold Roper, "Concrete Structures" , Materials, Maintenance and Repair ,Longman Scientific and Technical UK ,1991.

3. R.T.Allen and S.C.Edwards, “Repair of concrete Structures” , Blakie and Sons, UK,1987
4. Raikar, R.N., “Learning from failures –Deficiencies in Design” ,Construction and service-R&D Center (SDCPL),RaikarBhavan Bombay,1987.

Reference Books:

1. Santhakumar, A.R., “Training Course notes on Damage Assessment and repair in LowCost Housie”, “RHDC-NBO” Anna University, July,1992
2. Lakshmipathy, Metal Lecture notes of Workshop on “Repairs and Rehabilitation of Structures”,29-30th October 1999.
3. N.Palaniappan, “Estate Management, Anna Institute of Management”, Chennai, 1992

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 C:ENVIRONMENTAL IMPACT ASSESSMENT

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Continuous Assessment: 40 Marks	Theory: 3 Credits

Course Pre-requisites:

The Students should have knowledge of

1. Basic Knowledge of Physics, Chemistry and Mathematics
2. Basic Knowledge of Environmental Science
3. Basic Knowledge of Statistics and Computers

Course Objectives:

To learn the purpose and aims of EIA as well as EIA administration and practice thereby undertaking an EIA projects by understanding of the strengths and limitations of EIA with the costs and benefits of undertaking EIA

Course Outcomes:

On completion of the course, the students will be able to:

1. Appreciate the purpose and role of EIA in the decision-making process and understand the strengths of EIA in regard to environmental management;
2. Understand the technical and social/political limitations of EIA and know the administration and procedures that apply in the student's jurisdiction;
3. Understand the screening process and the scoping process and how it is applied
4. Know the options for estimating environmental and social impacts and the format of an EIA Report (Environmental Impact Statement, or Environmental Statement);
5. Appreciate the factors that assist, and destract, from the usefulness of the EIA Report
6. Understand the purpose of developing follow-up procedures, and the options for designing these procedures.

UNIT - I (6Hours)

Environmental Impact Assessment (EIA)

EIA: Background, Introduction, Purpose and aims of EIA, Nature and Scope of environmental issues and impacts, Principles of EIA administration and practice, Key elements of the EIA process, Costs and benefits of EIA, EIA Policy and Legislation, EIA Requirements of International Organizations, Principles for a Functional EIA System

UNIT - II (6Hours)

Screening and Scoping

Screening: Introduction, Screening procedure, Project lists for screening, Preliminary EIA, Screening Basics, Other types of Screening, Criteria for the determination of the need for, and level of, EIAScreening Exercise,

Scoping: Introduction, Purpose of scoping, Approaches to scoping, Scoping methods, Scoping Basics, Alternatives and tiering, Scoping in Practice

UNIT - III (6Hours)

Impact analysis and EIA Methods

Implications of the widening environment and sustainability agenda, Impact Identification, Impact Analysis/Prediction, Impact Analysis Basics, Characteristics of environmental impacts, Impact Characterization, Social Impact Assessment, Evaluation of impact significance, Significance Criteria, Impact Significance Assessment, Interaction Matrix and Simple Checklist Methods, Development of a Simple Matrix, Observations on Simple Matrices, Simple Checklists

UNIT - IV (6Hours)

Mitigation and Impact Management

Link between EIA process and Mitigation, Main Elements of Mitigation, Mitigation Basics, Approaches to Mitigation, Mitigation of Specific Impacts, Environmental Management Plan and Mitigation Measures, Impact Assessment and Mitigation, Public involvement: Introduction, Principles of public involvement, Scope of involvement, Planning a public involvement programme, Public involvement techniques, Arguments for and against public involvement, Stakeholders involved

UNIT - V (6Hours)

EIA Reporting and Review of EIA Quality

EIA Report, Typical Elements of an EIA Report, EIA Reporting Basics, Shortcomings encountered in Preparing EIA Reports, Guidelines for effective EIA report preparation and production, The Non-Technical Summary/Executive Summary, EIA Reporting Practice, Role and Purpose of the EIA Review Process, Need for a Systematic Approach, Procedural Aspects, Main Steps in the EIA Review, EIA Quality Basics, Carrying out the review, EIA Report Quality Assessment Exercise, Procedures for Evaluating EIA Reports

UNIT - VI (6 Hours)

Decision-making, Implementation and Follow-up

Role of the Decision-makers, EIA as part of the Decision-making Process, Decision-making: Procedural Considerations, Responsibility of the Decision-Makers, Key Objectives of EIA implementation and follow up, Tools for Environmental Management and Performance Review, Monitoring, Implementation Management Planning, Environmental Auditing, EMP and Audit Programme, Evaluation of EIA Effectiveness and Performance

Assignments:

1. The ways of modifying a project through EIA.
2. Legislative protections on a proposed development site in India
3. Some of the problems and advantages having the developer and/or consultant responsible for preparing the EIA documents
4. EIA Challenges especially in developing countries
5. Project of State Significance in India and what role does it play in the Indian system
6. Inventorisation of the natural resources available in India

Text Books:

1. Environmental Impact Assessment: A Practical Guide, Betty Marriott - 1997
2. Environmental impact assessment, Larry W. Canter - 1977
3. Introduction to Environmental Impact Assessment, John Glasson, RikiTherivel, Andrew Chadwick - 2013
4. Environmental Impact Assessment, Stephen Tromans - 2012
5. Environmental Impact Assessment: Practice and Participation, Kevin Hanna - 2015
6. Environmental Impact Assessment: A Methodological Approach, Richard K. Morgan - 1999
7. Methods of Environmental Impact Assessment, Peter Morris, RikiTherivel – 2001
8. Environmental Impact Assessment: A Guide to Best Professional Practices, Charles H. Eccleston - 2011
9. Introduction to Environmental Impact Assessment, John Glasson, RikiTherivel, Andrew Chadwick - 2005

Reference Books and Further Reading:

1. Ackland A, Hyam P and Ingram H (1999) Guidelines for Stakeholder Dialogue â€“ A Joint Venture. The Environment Council, London.
2. African High-Level Ministerial Meeting on Environmental Impact Assessment (EIA) Durban, South Africa. Communique (1995) issued by UNEP, Nairobi.
3. Ashe J and Sadler B (1997) Conclusions and Recommendations. In Report of the EIA Process Strengthening Workshop. (pp.109-118). Environment Protection Agency, Canberra.
4. Au E and Sanvicens G (1997) EIA Follow up and Monitoring in Report of the EIA Process Strengthening Workshop (pp. 91-107). Environment Protection Agency, Canberra.
5. Australian and New Zealand Environmental and Conservation Council (ANZECC) (1996) Guidelines and Criteria for Determining the Need for and Level of Environmental Impact Assessment in Australia. Working Group on National Environmental Impact Assessment, ANZECC, Canberra.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 D: BRIDGE & TUNNEL ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites

Students should have basic knowledge of

1. Waste water treatment
2. Engineering Chemistry

Course Pre-requisites:

The Students should have knowledge of

1. Engineering Geology
2. Geotechnical Engineering
3. Infrastructure Engineering, Traffic Engineering
4. Surveying
5. Hydraulics
6. Structural Engineering

Course Objectives:

To make the student understand various types of bridges & tunnels & their components. Students would also be able to decide factors affecting selection of bridge & tunnels.

Course Outcomes:

On completion of the course, the students will be able to:

1. describe bridge classifications & bridge components.
2. explain various forces acting on bridges.
3. manifest bridge bearings & its importance.
4. explicate tunnels & its site selection.
5. annotate various tunneling methods.
6. construe various safety requirements & maintenance methods in tunneling.

UNIT - I (06 Hours)

Bridge Engineering -: Introduction

Definition, Importance of bridge, Classifications of bridge, Components of bridge, Site Selection, Preliminary data to be collected, Determination of design discharge – Lineal waterway, Economical span, Afflux, HFL, Sub-soil exploration – Scour depth, Investigation report, choice of bridge type, quality assurance for bridge projects, Types of Analysis of Economic Costing ,Implemation of Methodology, quality control and assurance for bridge projects

UNIT - II (06 Hours)

Loading Standards for Design Bridges (With STAAD- Pro and C++)

Evaluation of bridge loading standard as per IRC specifications (dead load IRC, standard live load, Impact effect, wind load, longitudinal forces, centrifugal forces, horizontal forces due to water currents, buoyancy effect, earth pressure, temperature effect, seismic forces), forces acting on abutment, piers, wing wall & superstructure.

UNIT - III (06 Hours)

Types of bridges, bridge bearings& maintenance of bridges, and Rehabilitation of bridges

Types of bridges; culverts, temporary, moveable, fixed span, Methods of erecting bridges, maintenance of bridges, inspection of bridges, types of failures, bridge foundations (open, caissons etc.),

Classification of Highway Bridge parapets, Bearing; purpose & importance, materials specification, types of bearings, maintenance & Rehabilitation of Bridges

UNIT - IV (06 Hours)

Tunnel Engineering -: Introduction

Definition, General aspects, classification, purpose of tunnels, selection of Route advantages & disadvantages. Condition favorable for tunnel construction (influence of geological conditions), economics, setting out of tunnels, criterion for selection of size & shape, Open cuts, twin tunnels, pilot tunnels, portals, shafts

UNIT - V (06 Hours)

Tunneling alignment & methods

Surveying, Preliminary explorations, alignment & Grade, size & cross section of tunnels, types of drills, selection of drilling equipment & pattern, types of explosives, blasting techniques, Tunneling; hard rock, soft soils, tunneling methods using TBM, NATM method

UNIT - VI (06 Hours)

HSE (Health, safety & Environment) requirements & Maintenance of tunnels

Precautions in handling & storing of explosives, safety requirements during blasting operation, lining of tunnels, Maintenance; dust prevention, ventilation, Lighting, drainage, Introduction to Metro Tunnels & under water tunnel tubes.

Assignments: (Any Eight)

1. Write classification of bridges & its component.
2. Enlist & explain different types of load acting on a bridge structure.
3. Briefly explain different types of bridges.
4. Write a short note on bridge bearings (Classification, importance & maintenance).
5. Classify various types tunnels & explain advantages & disadvantages of each.
6. Write a short note on Open cuts, Twin tunnels, pilot tunnels, portals & shafts with neat sketches wherever necessary.
7. Illustrate various preliminary investigations & surveying required for tunnel construction.
8. Write a note on explaining various methods for;
    1) tunneling in soft soils
    2) tunneling in hard rocks

9. Prepare a power point presentation on use of TBM & NATM methods for tunneling.
10. Illustrate briefly the importance of lining, lighting, drainage, ventilation & dust prevention in tunnels.
11. Site visit & preparation of report on any bridge/tunnel structure.

Text Books:

1) Bindra S.P., "Principles & Practice of Bridge Engineering, Dhanpat Rai & Sons Publishers, New Delhi.
2) Rangwala S.C., "Bridge Engineering", Charotar Publishing House Pvt. Ltd., Gujarat.
3) Saxena S.C., "Tunnel Engineering", Dhanpat Rai & Sons Publishers, New Delhi.
4) Srinivasan R., "Harbour, Docks & Tunnel Engineering", Charotar Publishing House, Gujarat.

Reference Books:

1) Bickel J.O., "Tunnel Engineering Handbook", CBS Publishers, New Delhi.
2) Victor D.J., "Essentials of Bridge Engineering", Oxford & IBH Publications Co. Ltd., Mumbai.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 E:- ELECTIVE II - GROUND WATER HYDROLOGY

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites

The Students should have knowledge of

1. Engineering Geology and Soil Mechanics
2. Fluid Mechanics

Course Objectives:

Course attempts to provide knowledge and skills for effective ground water management

Course Outcomes:

On completion of the course, the students will be able to:

1. Explain types of aquifer and its properties
2. Describe movement of ground water through porous media.
3. Determine yield of an open and tube well
4. Explain construction and design of wells
5. Describe various methods of artificial recharge of ground water
6. Describe various parameters of ground water quality

UNIT - I (6 Hours)

Introduction

Introduction, Divisions of ground water, Sources of Ground water, Ground Water in various types of rocks, Hydrological Terms , types of aquifer, Porosity, Specific Yield, Specific Retention, Specific yield and its determination,

UNIT - II (6 Hours)

Movement of Ground Water

Darcy's Equation, Permeability, Factor affecting on permeability, Laboratory and field determination of permeability, Flow net and its properties, Flow net for Isotropic and Anisotropic Aquifer , Ground Water Flow Potential, Steady one Dimensional Flow, Ground Water Theory

UNIT - III (6 Hours)

Well Hydraulics

Flow into a wells, Dupit's assumption, , Steady radial flow into in unconfined aquifer and confined aquifer, Well losses, Specific Capacity of well, well Efficiency, Interference among wells, Cavity wells, Pumping Test Method:- Theis method, Jacob Method, Chow Method

UNIT - IV (6 Hours)

Water Well Construction and Design

Types of water wells:- Open Well and Tube well, Method of Construction of open Well and tube well, Design of water well, Infiltration Gallery, water well construction

UNIT - V (6 Hours)

Ground Water Recharge Methods

Introduction, Methods of Ground water recharge, Types of Artificial and natural ground water recharge, Suitability of artificial recharging methods, Well shrouding and well development, other sources of ground water

UNIT - VI (6 Hours)

Ground Water Quality and Pollution

Chemical composition of Ground water, water sampling, water quality for Industrial use and Domestic use, sea water contamination in ground water, ground water pollution.

Assignments:

1. Determination of specific yield of an aquifer
2. Use of flow net for ground water studies
3. Problems on pumping test method.
4. Assignment on different types of wells
5. Assignment on ground water quality for industrial use and domestic use.
6. Visit to nearby water harvesting structure and prepare a report.
7. Problems on well hydraulics

Text Books:

1. Dr. P.N.Modi, Irrigation Water Resources and Water Power Engineering , Standard Book House 2012
2. Garg S.K. ,Irrigation Engineering and Hydraulic Structures, Khanna Publisher ,2006

Reference Books:

1 Raghunath H.M., Ground Water :, New Age International Publishers

2 Todd D.K. Ground water Hydrology , John Wiley and sons

3 Rastogi A.k. , Numerical ground water hydrology, Pennram Publishers

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

47 F GEOINFORMATICS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites

The Students should have knowledge of

1. Basic knowledge of Physics, Chemistry and Mathematics
2. Basic knowledge of Geography, Maps and Surveying
3. Basic knowledge of Computers and graphic softwares

Course Objectives:

To provide the students insight of Geoinformatics and its applications in Resource Conservation and Management, Disaster Management, Environmental Pollution Management, Civil Engineering and Construction Management and Sustainable Development

Course Outcomes:

On completion of the course, the students will be able to:

1. Apply Geoinformatics technologies and the technologies used in Geographical Studies
2. Analyze and Understand Aerial Photographs procured from the technology of Aerial Photogrammetry and the information to be retrieved with the help of Visual Interpretation and Stereoscopy
3. Understand the components and principles of GPS, DGPS Concepts and GPS Applications in Military, Transport network planning and management, Meteorology and climate change, Telecommunications
4. Apply and use the concept of Remote Sensing and applications in the field of Civil and Environmental Engineering and interpret images and photographs procured from Satellites

5. Familiarize with various GIS softwares for developing thematic maps by Geo-referencing and Geo-coding and analyze Spatial Data with the help of Digital Elevation Model
6. Apply the Geoinformatics techniques in the field of Land Resource, Water Resources, Urban Planning, Geo-technical Engineering, Environmental Management

UNIT - I (6 Hours)

Geoinformatics

Introduction, Scope and Importance of Geoinformatics, Geoinformatics technologies and the technologies used in Geographical Studies, Geoinformatics and other Information Sciences, Geoinformatics-Spatial and Non –Spatial data Management. Spatial information Technology, Applications of Geo-Informatics: Urban planning and land use management, Tourism, Virtual globes, Environmental modeling and analysis, Military, Transport network planning and management, Agriculture,

UNIT - II (6 Hours)

Photogrammetry

Aerial Photograph: Introduction, Comparison of Aerial Photograph And Map

Aerial Photography: Introduction, Specifications For Aerial Photography, Planning of Photographic Flights, Execution of Flight, Aerial Cameras, Aerial Films, Completion of Photographic Task, Production of Positive Copies

Aerial Mosaics: Introduction, Planning for Mosaics, Mosaic Compilation, Annotation and Reproduction, Choice of Methods

UNIT - III (6 Hours)

Global Positioning System

Introduction, Components of GPS, Operational Principle, Facts and Limitations of GPS, GPS Receivers, Total Station Surveys Differential GPS: Introduction, DGPS Concepts, Types of DGPS GPS Applications in Military, Transport network planning and management, Meteorology and climate change, Telecommunications

UNIT - IV (6 Hours)

Remote Sensing (RS)

Basic Concepts: Introduction, Multispectral Remote Sensing, Multispectral Photography, Multispectral Scanning Remote Sensing in Thermal Infrared Region, Emissivity, Thermal Infrared Sensors, Characteristics of Thermal Images, Applications Remote Sensing in Microwave Region: Passive System, Active System, Satellite Radar Systems, Radar Image Characteristics, Radar Image Interpretation Satellite Remote Sensing: Introduction, LANDSAT, IRS and Other Satellites Satellite Image Interpretation: Visual Interpretation, Digital Image Processing, Applications of Satellite Imagery.

UNIT - V (6 Hours)

Geographical Information System (GIS)

GIS Concept: Functions and use of GIS, Spatial Data Representation, Relationships of Spatial Objects, GIS Functions, Spatial (Raster and Vector) and non-spatial (Relational, Network and Hierarchical), Geo-referencing and Geo-coding, Spatial Data Analysis, Digital Elevation Model

UNIT - VI (6 Hours)

Remote sensing GIS Applications

Application in Land Resource: Remote sensing in mapping soil degradation, impact of surface mining on land resources, forest resources.

Application in Water Resources: Remote sensing in hydro-geomorphologic interpretation for groundwater exploration, reservoir sedimentation, .

Application in Urban Planning: Mapping urban land use, transportation network, ity mapping, urban sprawl, site selection for urban development, Urban Information System

Application in Geo-technical Engineering: Slope stability and drainage network analysis, Digital Terrain Modeling,

Application in Environmental Management: Selection of disposal sites for industrial and municipal wastes,

Assignments: (At least 10 assignments out of 12 to be completed)

1. Arial photograph interpretation
2. Visual interpretation of multispectral and panchromatic image
3. Image rectification and classification, supervised and unsupervised classifications
4. Digital database creation – Point features, Line features, Polygon features
5. Data Editing-Removal of errors – Overshoot & Undershoot, Snapping
6. Construction of different thematic maps in GIS
7. Introduction to GPS and initial setting
8. Point Data collection using GPS with different datum
9. Case studies on Applications of Remote sensing and GIS in Urban planning
10. Case studies on Applications of Remote sensing and GIS in water resources
11. Case studies on Applications of Remote sensing and GIS in environmental management
12. Case studies on Applications of Remote sensing and GIS in agriculture.

Text Books:

1. An Introduction to Geoinformatics - G. S. Srivastava, McGraw Hill Education; First edition
2. Jensen, J.R., "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi, 2000
3. George Joseph, "Fundamentals of remote sensing", Universities press (India) Pte Ltd., Hyderabad, 2003
4. Kang-tsung Chang 2002,'Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi.
5. C.P.Lo and Albert K.W.Yeung 2005 "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India,New Delhi.
6. Leicka. A.: GPS Satellite Surveying, John Wiley & Sons, use. New York

7. Terry-Karen Steede, 2002, Integrating GIS and the Global Positioning System, ESRI Press
8. Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany.
9. Lillesand, Thomas M. and Kiefer, Ralph, W., “Remote Sensing and Image Interpretation”, 4th Edition, John Wiley and Sons, New York, 2000
10. Rampal, K.K., Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi, 1999

Reference Books:

1. Sabins, F.F. Jr., ‘Remote Sensing – Principles and Interpretation”, W.H. Freeman & Co., 2002 Edition.
2. Reeves, Robert G., “Manual of Remote Sensing, Vol. I, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia, USA
3. Burrough, Peter A. and Rachael McDonnell,1998, ‘ Principles of Geographical Information Systems’ Oxford University Press, New York.
4. Magwire, D. J., Goodchild, M.F. and Rhind, D. M. Ed. 1991,‘Geographical Information Systems: Principles and Applications', Longman Group, U.K.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

47 G : ADVANCED CONCRETE TECHNOLOGY AND COMPOSITES

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
	Continuous Assessment: 40 Marks	

Course Pre-requisites

The Students should have knowledge of

1. Engineering Chemistry
2. Basic Concrete Technology
3. Construction practices
4. Construction methods

Course Objectives:

The student should be able to know properties of various types of advanced concretes, concreting methods and special types of concretes and their use.

Course Outcomes:

On completion of the course, the students will be able to:

1. know properties of various properties of advanced concrete, carry out mix design as per I.S. Code method.
2. know the properties and use of advanced concreting methods.
3. know the properties and use of special concreting methods.
4. analyse and design prefabricated concrete, know the use precast concrete elements.
5. know the properties of concrete with mixed ingredients.
6. know the properties and use of special types of concrete.

UNIT - I (06)

Introduction

Review of concrete as a structural material, study of concrete and its various ingredients for the properties such as strength, elasticity, shrinkage, creep, permeability, durability as Mix Design by I.S .Code Method, design of high strength mixes containing entrained air.

UNIT - II (06 Hours)

Advanced Concreting Methods

Study of Roller Compacted concrete, High Performance Concrete, Cold Rolled Concrete.

UNIT - III (06 Hours)

Special Concreting Methods

Study of Underwater concreting, Tri mix Concrete, Self Compacting Concrete.

UNIT - IV (06 Hours)

Precast Concrete

Analysis and Design of prefabricated concrete, Precast concrete construction joints in precast construction, erection and assembly techniques.

UNIT - V (06 Hours)

Concrete Composites

Fiber Reinforced Concrete using carbon, glass, steel, polypropylene fibers for its various properties.

UNIT - VI (06 Hours)

Special Types of Concrete

Ferro cement, Light Weight & High Density Concrete for its various properties.

Assignments: Any six from the list given below.

1. Assignment based on I.S.code mix design of concrete
2. Assignment based on advanced concreting methods.
3. Assignment based on special concreting methods.
4. Assignment based on precast concrete
5. Assignment based on carbon and glass fibre reinforced concrete.
6. Assignment based on steel fibre reinforced concrete.
7. Assignment based on polypropylene fibre reinforced concrete.
8. Assignment based on special types of concrete.
9. Assignment based on visit to sites of precast concrete

10. Assignment based on actual survey on use of special concrete at various locations.

Text Books:

1. M.S. Shetty -"Concrete Technology" --, S. Chand Publications
2. A R Santhakumar, -"Concrete Technology "-- Oxford University Press.
3. M. L. Gambhir, -"Concrete technology" -- Tata Mcgraw Hill Publications
4. P.N.Balguru & P.N.Shah "Fiber Reinforced Cement Composite" Wheeler Publications-.
5. P. Kumar Mehta and P. S. M. Monteiro—"Concrete: Microstructure, Properties and Materials"-- Tata Mc-Graw Hill Education Pvt. Ltd.

Reference Books:

1. A. M. Neville "Properties of concrete", Longman Publishers.
2. R.S. Varshney "Concrete Technology " Oxford and IBH.
3. N V Nayak,A .K.Jain "Handbook on Advanced concrete Technology" Edited by, Narosa Publishing House
4. Dr. D.B.Divekar "Ferrocement Construction Mannual- -Pune
5. Prof. Gajanan Sabnis"Concrete Mix Design---

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

48 : COMPUTER APPLICATIONS IN CIVIL ENGINEERING-IV

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Practical: 02 Hours / Week	Term Work and Oral: 50 Marks	Termwork: 01Credit

Course Pre-requisites

The Students should have knowledge of

1. Structural Analysis-I & II
2. Structural Design- II

Course Objectives:

The student should be able to design RCC structure using STAAD.Pro

Course Outcomes:

On completion of the course, using STAAD.Pro the students will be able to:

1. Analyse the Building frame and calculate design forces in the members
2. Design RCC members
3. Design RCC Framed Building

UNIT - I (08Hours)

Structural Analysis

Generation of skeletal model, Defining cross section and section properties, Generate and assign different types of supports, assign different types of nodal and member loads, Define load combination, analysis, static check, load list, post analysis, extract output/result of axial force, shear force, bending moment, torsional moment, deflection etc.

UNIT - II (08Hours)

RCC Design

Staad - Design parameters as per IS 456-2000 and their significance, Design of Beam, Design of Column, Check code, Check members passing and failing, Redesign for optimization, Calculation of material quantities, Design Reports

Term Work:

1. Analysis of Building frame and calculation of design forces in the members
2. Design of RCC Framed Building.

Text Books:

1. T.S. Sharma, "Staad.Pro v8i for beginners" , Notion Press

2. Sivakumar Naganathan, "Learn Yourself STAAD.Pro V8i",Lap Lambert

Reference Books:

1. Bentley Structures, "Staad.Pro Technical reference manual", Bentley Community e-book
2. IS 456 -2000

49: PROJECT STAGE I

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Practical: 02 Hours / Week	Term Work and Oral: 50 Marks	Termwork: 04 Credits

Course Pre-requisites

The Students should have knowledge of

1. Engineering Mathematics
2. Written and Communication skills
3. Analytical skills
4. Project planning and design

Course Objectives:

The student shall be able to identify the problem and suitable solution for the same.

Course Outcomes:

On completion of the course, the students will be able to:

1. Perform the literature review
2. Identify the grey area as the topic for work.
3. Decide the methodology

The project work shall consist of any project pertaining to Civil Engineering field or interdisciplinary field. The work may consist of any one or more of the following:

1. Critical Survey of literature
2. Experimental investigations

3. Design and fabrication of model
4. Design problems – use of latest software
5. Industrial assignments / field survey and analysis

Use of computers, laboratory testing, projects sponsored by industry are preferred.

Stage I consist of

1. Defining the topic of the project, scope of the project and experimental and design work involved.
2. Completing the literature review and methodology pertaining to the topic selected.
3. A report / term work is tobe prepared on work done in stage I

TW & ORAL:

It shall be based on work completed in stage I and the Termwork / Report submitted.

Unit Test -II UNIT – IV,V,VI

50: INPLANT TRAINING

	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Duration: 45 days	Term Work and Oral: 50 Marks	Termwork: 03 Credits

Course Pre-requisites

The Students should have knowledge of

1. Building construction,building Planning, Surveying, Advanced Surveying
2. Concrete Technology
3. Hydraulic Engineering, Irrigation Engineering
4. Infrastructure Engineering,
5. Estimation, Costing and Valuation

Course Objectives:

1. The student shall be able to identify various problems faced on site.
2. The student shall be able to find read the drawings and find out the quantities from them
3. The student shall be able to know methods of concrete mix design, design of various civil engineering structures.

Course Outcomes:

On completion of the course, the students will be able to:

1. complete the inplant training for 45 days in Civil Engineering/construction Industry /govt. organization/research organisation related to civil engineering.
2. know and implement various terms and problems on sites /design office related to civil engineering.
3. prepare the log book of day to day activities during his/her inplant training period and get it signed every day from the supervisor

4. complete a technical report/log book of his/her inplant training for 45 days duly certified by the officer in charge for the training.
5. explain and grade his/her experience of inplant training based on the knowledge received.
6. satisfactorily answer the questions and queries on work/experience of his/her inplant training completed.

Unit I **(Hours)**

Title

In view of getting exposure to industry / site / design office, a student has to undergo the inplant training for 6 weeks / 45 days in one of the Civil Engineering areas. The training may consist of any one or more of the following:

1. Working on any site with substantial work related to Civil Engineering
2. Working in any design office with work related to Civil Engineering Design
3. Working in any Civil Engineering industry / Government organisation / research organisation

Report:

A report on above training and the work completed during training duly certified by officer incharge for the training. The report to be submitted within fifteen days from the date of completion of the training.

Termwork and Oral:

Termwork and Oral examination shall be based on the Termwork submitted.

51: EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork:01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Basic concepts of equilibrium of a structure
2. Concepts of shears and moments in a frame
3. Geological concepts in civil engineering
4. Design of R.C.C. elements using limit state design.
5. Concept of various forces acrting on a frame and analysis of a frame.

Course Objectives:

The student should be able to know various causes of earthquakes, their types, various methods of determination of earthquake forces, design a shear wall and ductile detailing of buildings.

Course Outcomes:

On completion of the course, the students will be able to:

1. describe the causes and characteristics of earthquakes, effects of earthquake and various seismic zones
2. define single and multiple degree freedom system, different types of vibrations.
3. calculate the earthquake forces using Equivalent Static method as per I.S.1893-2002.
4. determine the earthquake forces using Dynamic method as per I.S.1893-2002, decide the choice of method.
5. design a shear wall by understanding the concept behind it.
6. design the various provisions in buildings for earthquake resistance and the ductile detailing provisions as per I.S. 13920-1993.

UNIT - I (06 Hours)

Earthquake and their effects

Geology of earth, configuration of tectonic plates in a globe, influence of Geology on earthquake, behavior of plates, their motion and effects, causes of earthquake ,Characteristics of Earthquakes, Earthquake parameters, magnitudes, intensity, scales, classification of earthquake, seismic zoning of India, seismic coefficients for different zones, Effects of earthquakes on buildings

UNIT - II (06 Hours)

Theory of vibrations

Vibrations - definition, causes, classifications. Single Degree of Freedom systems (SDOF) - Free, forced, damped, un-damped vibrations with basic examples. Introduction to Multi-degrees of Freedom systems (MDOF)

UNIT - III (06Hours)

Determination of Earthquake forces-Static Method

Introduction to IS1893 (Part-I): 2002, Seismic design Philosophy, basic definitions, Concept of OMRF &SMRF frames, Seismic coefficient method, Determination of base shear ,Lateral force , storey shear diagram, application to cantilevers

UNIT - IV (06 Hours)

Determination of Earthquake forces-Dynamic Method

Dynamic Methods, Response Spectra Method as per I.S. 1893,Choice of Method

UNIT - V (06 Hours)

Design of Shear Wall

Concept of Shear Wall in earthquake resistance, Design of Shear wall

UNIT - VI (06 Hours)

General Provisions and rules to be followed for buildings in seismic areas, Various irregulations in buildings, Ductile detailing of earthquake resistant design as per IS 13920:1993

Assignments: Any six from the list given below.

1. Assignment based on geology of earthquakes, causes of earthquakes.
2. Assignment based on effects of earthquakes, seismic zones
3. Assignment based on calculation live loads at different storey levels..
4. Assignment based on different types of vibrations.
5. Assignment based on calculation of various loads for different types of frames.
6. Assignment based on calculation of various loads for different types of soils.
7. Assignment based on calculation of various loads in different zones.
8. Assignment based on single degree freedom and multiple degree freedom system.
9. Assignment based on various irregularities in buildings.
10. Assignment based on ductile detailing as per IS 13920

Term Work:

1. Termwork should be based on above syllabus
2. Termwork should consist of
   i) projects on determinations of Earthquake forces using static method
   ii) projects on determinations of Earthquake forces using dynamic method
   iii) project on design of shear wall.

Text Books:

1. B.N.Duggal "Earthquake resistance design of structure - Oxford University Press.
2. Dr. Vinod Hosur " Earthquake – Resistant Design of Building Structures"- Wiley India
3. Earthquake Tips NICEE, IIT, Kanpur
4. Jai krishna and Chandra shekharan "Elements of Earthquake Engineering "

5. N.Subramanian “ Design of Steel Structures”, Oxford University Press

Reference Books:

1. Clough R.W. and Penzin J “Dynamics of structure’. McGraw Hill Civil Engineering
2. Anil Chopra “Dynamics of structure ‘, Prentice Hall India Publication
3. Mario Paz “ Dynamics of structure”, CBSPD Publication
4. Kramer S. L. ‘Geo-technical Earthquake Engineering ‘,Prentice Hall India Publication
5. John M. Biggs “Introduction to Structural Dynamics’
6. I.S.1893-2002 and I.S. 13920-1993

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

52: WATER RESOURCES ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 4 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 1 Hour / Week	Term Work and Oral: 50 Marks	Term work: 1 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Fundamentals of Soil and Fluid Mechanic.
2. Fundamentals of Mathematics and Statistics.

Course Objectives:

Students will study hydrological analysis and design hydraulic structures.

Course Outcomes:

On completion of the course, the students will be able to:

1. Describe methods of Measurement of precipitations and its analysis for planning water resources project.
2. Describe methods of estimation of evaporation and infiltration and their use for hydrological studies.
3. Describe the methods of stream flow measurement and design the flood hydrograph.
4. Describe process of reservoir planning and design the gravity dams.
5. Design and construction of earth dams.
6. Hydraulic design of spillways and energy dissipation arrangement.

UNIT - I (06 Hours)

Precipitation and its measurement

Introduction to Hydrology , Hydrological Cycle, Applications in Engineering, Formation of precipitation, Types of Precipitations, Measurement- rain gauges, estimation of missing data, mean precipitation over an area, presentation of rainfall data, depth area duration relationship, intensity duration frequency relationship, frequency of point rainfall

UNIT - II (06 Hours)

Evaporation and Infiltration

Initial losses, Evaporation Evapo transmeters, imperial methods for estimation of evaporation, evapotranspiration, methods to reduce evaporation, infiltration process, factors affecting infiltration, infiltration equations, measurement of infiltration, infiltration indices,

UNIT - III (06 Hours)

Stream Flow Measurement and Hydrograph

Stream flow measurement, measurement of stage, measurement of velocity, area velocity method, slope area methods dilution techniques/tracer methods, run off, factors affecting, hydrograph, Unit hydrograph, theory and applications. Methods of flood estimation, rational method.

UNIT - IV (06 Hours)

Reservoir planning and Gravity dams

Investigations for reservoir planning, various storage zones, estimation of reservoir capacity by mass curve method, Gravity dams forces acting and their combinations, criteria for structural stability, modes of failure, elementary profile of gravity dam, construction of gravity dam, Use of colgrout masonry ,foundation treatment.

UNIT - V (06 hours)

Earth dams

Classification of earth dams, method of construction ,basic design considerations in design of section, phreatic line and its location, stability of slopes ,design of filters ,rock toe and pitching, internal drainage arrangement, cut of trench. Causes of failure of earth dams.

UNIT - VI (06 Hours)

Spillways and hydropower structures

Introduction , function , components, classification ,selection of type of spillway, hydraulic design of ogee spillway, Energy dissipation below spillway- hydraulic jump type and bucket type, spillway gates.

Assignments:

1. Numericals on precipitation.
2. Estimation of net run off from given catchment knowing the infiltration index.
3. Numericals on
4. Unit hydrograph.
5. Case studies on types of gravity dams.
6. Report on colgroute masonry construction of gravity dams.
7. Numericals on spillways
8. Study of different sections of earth dams used in field for different site conditions and different materials

Term Work:

Term Work will consist of minimum eight assignments from list given below.

1. Marking the catchment area for a given reservoir site on topographical maps and Estimation of Mean precipitation for given catchment area.
2. Estimation of reservoir capacity by mass curve method
3. Design a flood hydrograph from a given unit hydrograph.
4. Design of hydrographs of different duration from a given UH.
5. Site Visit to water resources project.
6. Stability analysis of gravity dams.
7. Stability analysis of earth dams.
8. Hydraulic design of spillway and energy dissipation arrangement.
9. Study and draw typical layout of high head hydropower plant.

Text Books:

1. Dr. P.N. Modi “Irrigation Water Resources and Water Power Engineering “ , Standard Book House.2014
2. S. K. Garg “Irrigation Water Resources and Water Power Engineering” Khanna Publishers, 2006.
3. ” K. Subramanian “Engineering Hydrology” Tata Mc Graw Hill 2015

4. Dr P. Jaya Rami Reddy “A Text Book of Hydrology” . University Science Press New Delhi.2008

Reference Books:

1. V.T. Chow “Applied Hydrology “, Mc Graw Hill Publications 2003
2. R.S. Varshney Concrete dams , , Oxford and IBH ,2000
3. Bharat Singh and R.S.Varshney Embankment dams , Oxford and IBH ,2000

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

53 : INFRASTRUCTURE ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. surveying.
2. concrete technology.
3. geotechnical engineering.
4. foundation engineering.

Course Objectives:

1) To make the student understand & design various components of a railways, highway & airport.

Course Outcomes:

On completion of the course, the students will be able to:

1. carry out surveys involved in planning & highway alignment.
2. carry out traffic survey & geometric design for highway construction.
3. describe flexible & rigid pavements as per IRC
4. describe various components of permanent way.
5. construe geometric design of a railway track & signaling in railways.
6. annotate components of an airport.

UNIT - I Highway Engineering (06 Hours)

Scope of Road transportation, Highway Development in India,Road Plans: Nagpur, Bombay & Lucknow, determination of road length. Road Classification & patterns, preliminary surveys, Highway alignment,Repairs & maintenance, quality control, concept of BOT, BOOT & BOLT.

UNIT - II (06 Hours)

Traffic Engineering & Geometric design

Traffic Engineering: Traffic characteristics, Volume studies, speed studies, capacity, density, traffic regulations & control device, types of road intersection.

Geometric Design : Camber, Super Elevation, Road Margin, pavement width, right of the way, gradient, sight distance, stopping distance, shoulder, design speed, cross section of roads (cutting & embankment), Highway drainage.

Curves:horizontal transition curves, grade compensation on horizontal curves, vertical curves.

UNIT - III (06Hours)

Pavement Design & Highway Materials

Road Pavement: types, design factor, design of flexible pavement by CBR method (IRC 37- 2001 & 2012), methods of rigid pavement design (IRC 58 – 2002), load & temperature stresses (IRC recommendations for Road failure), Joints.

Highway Materials: Importance & properties of sub grade (soil), pavement component materials, aggregates.

Bitumen: Types, Bitumen mix design (Marshall stability test).

UNIT - IV (06 Hours)

Railway Engineering

History & Development, comparison to different modes of transports, Location surveys & alignment, permanent way, gauges, necessity of uniformity of gauges.

Rails: types & functions, defects, rail flaw detector, joints.

Sleepers: classification & functions, sleeper density

Ballast, formation & subgrade, rail fixtures & fastening, L.W.R.& S.W.R., advantages of welded joints.

UNIT - V (06 Hours)

Geometric Design, Points, Crossings & Signaling in railways

Geometric Design: Cross-sectional elements of a railway tract, Gradient, Curves, Super Elevation, cant deficiency.

Points & Crossings: Types, Turnouts, design of diamond crossing & cross over.

Signaling:Objects, principles & classification, interlocking, turntable, buffer stops, scoth block.

Introduction to Metro, mono rails& Pod taxi.

UNIT - VI (06 Hours)

Airport Engineering

Airport: planning & layout, classification, orientation, aircraft characteristics, airport obstructions, Runway, taxiway, aprons, terminal area.

Assignments:

1. Solve numerical problem on determination of road length according to Nagpur, Bombay & Lucknow plan.
2. Write a short note on BOT, BOOT & BOLT type of projects.
3. Define all the terms related to cross section of highway with neat sketches of each (in embankment & cutting).
4. Solve a numerical on calculationof sight distance on highway.
5. Write a short note on pavement design of highways (Flexible & Rigid) according to IRC guidelines.
6. Draw a neat sketch of a cross section of a railway track explaining all its components & their functions.
7. Write a short note on Gradients, Curves, Super Elevation, cant deficiency.
8. Explain the advantages of SWR & LWR.
9. Write classification of different types of signals & briefly explain semaphore signal.
10. Draw a layout of an airport illustrating all its components& their functions.
11. Write a short on Inland Waterways & its scope in India.

Term Work:

1) List of experiments: test on aggregates (any four)
   a) Aggregate Impact Test
   b) Los Angeles Abrasion Test
   c) Crushing Test on aggregates
   d) Flakiness Index & Elongation Index
   e) Specific gravity & Water absorption test
   f) Bitumen stripping value Index
   g) Use of Antistripping compound
2) List of experiments :test on Bitumen (any five)
   a) Specific gravity test
   b) Penetration test
   c) Ductility test
   d) Softening point test
   e) Viscosity test
   f) Flash point & Fire point test
   g) Benkelman Beam Test
   h) Marshal stability test
3) List of experiments: test on soil.
   a) California Bearing Ratio Test

Text Books:

1) Khanna S.K. & Justo C.E.G., "Highway Engineering", Nem Chand & Bros Publishers, Roorkee, Uttarakhand.
2) Arora & Khanna, "Airport Engineering", Nem Chand & Bros Publishers, Roorkee, Uttarakhand.
3) Saxena S.C., "A Text book of Railway Engineering", DhanpatRai& Sons Publishers, New Delhi.

Reference Books:

1) Mundrey J.S., “Railway Track Engineering”, Tata McGraw Hill Publications, New Delhi.
2) Satish Chandra & Agrawal M.M., “Railway Engineering”, Oxford University Press, New Delhi.
3) ParthaChakraborty&Animesh Das, “Principles of Transportation EngineeringEngineering”,
4) Norman J. Ashfor, Saleh A. Mumayiz&Paul H. Wright, “Airport Engineering: Planning, Designand Development of 21st-Century Airports”, John Wiley & Sons Publishers,New Delhi

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

54 A : DISASTER MANAGEMENT

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50Marks	Termwork: 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Engineering Geology
2. Advanced Surveying
3. Project Management

Course Objectives:

To make the student understand various disaster management strategies for massive hazards.

Course Outcomes:

On completion of the course, the students will be able to:

1. construe various disasters & role of civil engineer during such hazards.
2. manifest various geological disasters & their consequences.
3. explicate various hydro-meteorological disasters.
4. annotate various disaster management & risk assessment strategies.
5. describe use of various scientific & technological tools for disaster forecasting & its dissemination as warning.
6. explicate various disaster management techniques used for rescue operations during the disaster.

UNIT – I (06 Hours)

Disaster Management : Understanding disasters

Disaster- Definition & Concept, Types, Mitigation, Preparedness, Phases of Disaster Management- response, recovery, rehabilitation, information & public awareness, role of government in disaster management (NIDM), principle components of disaster management, organizational structure for disaster management, study of recent disasters, role of Civil Engineer in disaster management.

UNIT – II (06 Hours)

Geological & Manmade Disasters

Earthquake- Different types of earthquake waves, seismic zoning of India, liquefaction of soil

Tsunami- The process of triggering waves, dynamics of tsunami waves, management of tsunami disaster

Landslides- causes, signs, early warnings systems, means of mitigation

Blasts- Mechanism, causes, characteristics, preventive and control measures of fire, Investigation after explosion.

UNIT – III (06 Hours)

Cyclones, Flood, Drought & Fire disasters

Cyclones- major location of occurrence, intensity of classification, cyclone, management & mitigation

Flood- types of flood, effects of flood, flood defenses & management,

Drought- concept of Drought, consequences of drought, management & risk reduction, mitigation

Fire- detection & alarms, fire resistance, fire endurance, mitigation measures

UNIT – IV (06 Hours)

Disaster Management Cycles,

Disaster management cycle- Paradigm shift in disaster management, financial relief expenditure, legal aspects, rescue operations, risk management (pre & post disaster), zone & macro zone formation, Infrastructure- early recovery, reconstruction & redevelopment,Disaster prevention &Risk assessment strategies- IDNDR, Yokohama Strategy, Hyogo framework of action

UNIT – V (06 Hours)

Application of Science & Technology for Disaster Management

Geo- informatics tools in disaster management, prediction & assessment (RS, GIS & GPS), buoys, Disaster Communication system (Early Warning & its dissemination), Disaster safe designs constructions,

UNIT – VI (06 Hours)

Emergency Management

Rescue operations- use of Helicopters, transportation, detection of areas of disasters, Global, National, Local management systems for various disasters,

Short term/long term effects & measures to be taken to overcome, SWOT analysis based on design & formulation strategies, S & T institution for disaster management, methods of assessment of impact of disasters such as photogrammetric methods, ground data collections, school awareness & safety assurance programme

Assignments:

1. Name the government organizations related to disaster management & their role in pre, post & during disaster situation.
2. Mention the role of Civil Engineer in various disaster situations.
3. Explain the causes & types of earthquakes. Briefly explain the concept of plate tectonics in earthquakes.
4. Explain the phenomenon of Tsunami, briefly mentioning tsunami prediction tools.
5. Write a short note on cyclonic, flood, drought & fire disasters.
6. Explain the various components of disaster management cycle.
7. Briefly discuss various Disaster prevention & Risk assessment strategies.
8. Explain the advantages of usingScience & Technology for Disaster Management.
9. Briefly explain various medium used asDisaster Communication systems (Early Warning & its dissemination).
10. List out various rescue operation methods for various disasters.

Term Work:

1) Write case studies (any three– 03) on any disaster & disaster management techniques used covering topics mentioned below.

   (use imageries & site data if available to support your answer)

   a) Type & cause of disaster.

   b) Pre & Post disaster risk assessment.

   c) Disaster mitigation after the disaster.

   d) Use of Science & technology for various aspects of disasters.

   e) Emergency management (Use of any other tools or risk assessment strategies.

   f) Impact of disaster.

   g) Rehabilitation (pre-post disaster).

   h) Mention role of government agencies co-ordinating during disaster.

Text Books:

1) Srivastava H.M., Bhattacharya S.N., Gupta G.D., "Earthquakes Geography and Management", New Age International (P) Ltd., Publishers, New Delhi.
2) Singhal J.P., "Disaster Management", Laxmi Publications, New Delhi.
3) K. Elangovan, "GIS: Fundamentals, Applications and Implementations", New India Publishing Agency, New Delhi.

Reference Books:

1) Dr. Mrinali Pandey, "Disaster Management", Wiley India Pvt. Ltd.
2) Tushar Bhattacharya, "Disaster Science & Management", Mc Graw Hills (India), Pvt., Ltd.

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 B : ADVANCED STEEL DESIGN

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50Marks	Termwork: 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Strength of Materials
2. Structural Design - I

Course Objectives:

The student will able to design Building, Truss Bridge, Plate Girder and its foundation using Structural Steel

Course Outcomes:

On completion of the course, the students will be able to:

1. design the member for different forces.
2. design moment resisting connection.
3. design plate girder
4. design building frame
5. design column foundation
6. evaluate design forces for gantry girder and truss bridge.

UNIT - I (06Hours)

Design of Structural Members:

Design of Members for Axial Tension, Axial Compression, Shear and Bending Moment. Check for deflection.

UNIT - II (06Hours)

Design of Moment Resisting Connection:

Design of bolted connection for Moment, Design of bolted connection for Moment, Design of connection for combined Shear and Moment.

UNIT - III (06Hours)

Design of Welded Plate Girder:

Design of Cross section, Design of connection between web and flange, Design of Load carrying and Load bearing Stiffeners, Design of Intermediate Stiffeners, Design of Horizontal Stiffeners, Design of connection between stiffeners and section.

UNIT - IV (06Hours)

Design of Building Frame:

Load Calculation, Analysis of Frame, Design of Beams, Design of Columns, Design of Beam to Beam connection, Design of Beam to Column connection.

UNIT - V (06Hours)

Design of Foundation:

Design of Column base, base plate and anchor bolt, Design of RCC Footing.

UNIT - VI (06 Hours)

Design Philosophy for different structures:

Design philosophy for Gantry Girder, Truss Bridges.

Assignments:

1. Design of member for tension and compression.
2. Design of member for shear and moment
3. Design of bolted connection for moment
4. Design of welded connection for moment
5. Design of cross section for plate girder.
6. Design of stiffeners
7. Design of Beam to beam connection

8. Design of Beam to column connection
9. Draw layout of gantry girder or truss bridge.

Term Work: Design of any one project below-

1) Plate Girder
2) Building Frame

which includes-

1. Calculation of loads, Analysis and calculation of member forces
2. Design of different elements for member forces
3. Design of connections
4. Drawing Sheets using AutoCad.

Text Books:

1. S. K Duggal, "Limit State Desin of Steel Structures", Tata McGraw-Hill Education
2. S.S.Bhavikatti, "Design of Steel Structures: By Limit State Method", I K International Pub
3. M. R. Shiyekar, "Limit State Design in Structural Steel", Prentice-Hall of India

Reference Books:

1. N. Subhramanian, " Design of Steel Structures", Oxford University Press
2. Dr. Ramchandra, "Limit State Design of Steel Structures", Scientific Pub
3. IS:800-2007, General Construction in Steel - Code of Practice"
4. IS:875-1987, "Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)"
5. SP-6(6)- 1972, "Handbook for Structural Engineers"

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

54 C : SOLID WASTE MANAGEMENT

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 1 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Basic Knowledge of Physics, Chemistry and Mathematics
2. Basic Knowledge of Environmental Science
3. Basic Knowledge of Statistics and Computers

Course Objectives:

To learn the concept of Solid Waste Generation and understand its need and importance to Reuse, Recycle, Refuse and thereby, effectively manage the problem of Solid Waste generated as well as mitigation and combating the issue of land pollution.

Course Outcomes:

On completion of the course, the students will be able to:

1. Understand the generation, sources and characteristics of Solid Waste
2. Classify the types of the collection and storage of Solid Waste
3. Familiarize with the Present Scenario of transporting the Solid Waste by analyzing inefficient and Unscientific Manual Loading Of Waste and Understand the screening and scoping process and how it is applied
4. Know the options for sorting the solid waste at Source, Waste Processing Site and Land filling Site
5. Understand Site Investigation and Site Characterization for Landfill by Proper Planning And Design as well as Principles Of Composting by Manual And Mechanized Methods
6. Familiarize with latest Emerging Processing Technologies for Solid Waste for Treatment and Recovery of useful Products

UNIT - I (6 Hours)

Solid Waste Management

Solid Waste: Definitions And Classification Of Solid Wastes, Composition, Characteristics And Quantities, Per Capita Quantity Of Municipal Solid Waste In Indian Urban Centers, Estimation Of Future Per Capita Waste Quantity, Physical Characteristics, Chemical Characteristics

Solid Waste Management: Introduction, Objective, Principles, Functional Elements, Components, Solid Waste Generation, Environmental Impact Of Solid Waste Disposal On Land, Management System, Linkages Between Municipal Solid Waste Management System And Other Types Of Wastes Generated In An Urban Centre, Materials Flow Chart For Municipal Solid Waste, Legislation and Rules of SWM in India

UNIT - II Collection and Storage of Waste (6 Hours)

Collection: Introduction, Present Scenario, Tools & Equipment, Methods Of Primary Collection Of Waste, Collection Of Waste From Shops And Establishments, Collection Of Bio-Medical Waste, Collection Of Hotel And Restaurant Waste, Collection Of Construction And Demolition, Collection Of Domestic Hazardous & Toxic Waste

Storage: Introduction, Present Scenario, Storage Of Recyclable Waste, Provision Of Litter Bins On The Streets, Provision Of Special Containers For Storage Of Domestic Hazardous And Toxic Wastes, Measures To Be Taken By The Local Bodies Towards Segregation Of Recyclable Waste

UNIT - III (6 Hours)

Transportation of Waste

Introduction, The Present Scenario: Inefficient And Unscientific Manual Loading Of Waste Irregular Transportation, Underutilization Of Fleet Of Vehicles, Open Trucks Cause Nuisance, Non-Routing Of Transportation Of Waste From Hotels/Restaurants/Hospitals/Construction Site, Measures To Be Taken To Improve The System: Domestic/Trade/Institutional Waste, Routing Of Vehicles, Use Of Vehicles In Two Shifts, Type Of Vehicles To Be Used, Bio-Medical Waste From Hospitals/Nursing Homes/Health Care Establishments, Transportation Of Waste From Hotels & Restaurants, Transportation Of Construction Waste And Debris, Transportation Of Waste

From Narrow Lanes, Setting Up Of Transfer Station, Lifting Of Waste From The Transfer Station, Workshop Facility For Vehicle Maintenance, Fleet Of Vehicles To Be Maintained, Parking Of Workshop Vehicles

UNIT - IV (6 Hours)

Sorting and Material recovery

Sorting: Introduction, Objectives, Stages, Primary and Secondary / Tertiary Sorting, Primary Sorting At Source, Primary Sorting At The Community Bin (Municipal Bin), Primary Sorting At Landfill, Secondary / Tertiary Sorting, Occupational Health, Toxicity Related Hazards, Hazardous Substance Containers, Household Batteries And Other Toxic, Infectious, Non-Recyclable, Problems And Desirable Change, Long-Term Desirable, Sorting At Waste Processing Site, Sorting Prior To Land filling

Material Recovery: Introduction, Guidelines for Sorting for Materials Recovery, Material Recovery at the Source, Community Bin (Municipal Bin), Waste Storage Depot, Transfer Station, Intermediate Sorting at Central Sorting Facility, Waste Processing Site, Land filling Site

UNIT - V (6 Hours)

Landfill and Composting

Landfill: Introduction, Land filling Of Municipal Solid Waste, Environmental Impact And Its Minimization, Essential Components, Site Selection, Site Investigation And Site Characterization, Landfill Planning And Design, Design And Construction Of Landfill Liners, Construction And Operational Practice, Post-Closure Stabilization, Operation And Care, Landfill Quality Assurance And Quality Control, Land filling Costs, Manpower Requirements, Remediation Of Old Landfill Sites

Composting: Introduction, Principles Of Composting – Manual And Mechanized Methods, Windrow Composting, Factors Affecting The Composting Process, Control Of Composting Process, Properties Of Compost, Mechanical Composting, Unit Processes, Environmental Control

UNIT - VI (6Hours)

Emerging Processing Technologies

Introduction, Vermicomposting, Biogas from Municipal Solid Wastes, Conversion Of Solid Wastes To Alcohol Fermentation, Pyrolysis, Plasma Arc Technology/Plasma Pyrolysis Vitrification, Refuse Derived Fuel, Hydro pulping, Slurry Carb Process, Treatment For Recovery Of Useful Products

Assignments:

1. Segregation and Storage of Waste at Source
2. Abolish open waste storage depots and other Inefficient waste storage devices
3. Public Private Partnership in SWM Services
4. Private Sector Participation
5. Provision of SWM Services in slums
6. Allotment adequate funds for capital and revenue Expenditure for SWM

Text Books:

1. Handbook of Solid Waste Management, George Tchobanoglous and Frank Kreith, Second Edition, McGRAW-HILL
2. Solid Waste Management, K. Sasikumar, Sanoop Gopi Krishna, PHI Learning, 2009
3. Solid Waste: Engineering Principles and Management Issues, , George Tchobanoglous, 1st Edition, McGRAW-HILL
4. Solid Waste Technology and Management Vol. 1 and 2, Thomas Christensen, Wiley Publishing, 2010
5. Solid Waste Management, Stefen Burnley, Wiley Publishing, 2014

Reference Books and Further Reading:

1. Assessment of the Status of Municipal Solid Waste Management in Metro Cities, State Capitals, Class I Cities and Class II Towns in India: An Insight . Sunil Kumar, J.K. Bhattacharya, A.N. Vaidya, Tapan Chakrabarti, Sukumar Devotta, A.B. Akolkar. Kolkatta : Central Pollution Control Board (CPCB), National Environmental Engineering Research Institute (NEERI), 2008.
2. Ministry of New and Renewable Energy, MNRE. National Master Plan for Development of Waste-to-Energy in India. Ministry of Environment and Forests. [Online] 2003.
3. Census of India, 2011. Census of India. [Online] 2011.

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III
Unit Test -2 UNIT – IV, V, VI

54 D: ENTREPRENEURSHIP DEVELOPMENT

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment:40 Marks	
	Term Work and Oral:50 Marks	Termwork: 01Credit

Course Pre-requisites:

The Students should have knowledge of

1. Project Management
2. Construction Management
3. Engineering Economics and Financial Management
4. Construction Techniques and Machinery

Course Objectives:

The purpose of this course is to generate a new breed of entrepreneurs on an ongoing basis. This course will create in them the necessary knowledge, attitudes, skills and competence to start and manage a new enterprise. It will also train them to be innovative in creating and managing business units started by them and manage change.

Course Outcomes:

On completion of the course, the students will be able to:

1. develop the ability to select potential areas for self-employment
2. identify information and use of technology for Business Initiatives.
3. understand the use of technology to design and structure the organization
4. select appropriate agency/ies for technical and financial support.
5. prepare preliminary and detailed project report.
6. manage sales and sales promotion.

UNIT - I (06Hours)

Introduction to Entrepreneurship

Definition entrepreneurship and enterprise, Concept, Classification & Characteristics of Entrepreneur, need and scope of entrepreneurship in Civil Engineering, Entrepreneurship as career, present scenario of with respect to entrepreneurship in India.

UNIT - II (06Hours)

Business Opportunity Identification

Opportunity search : Divergent Thinking Mode : Meaning and Objectives – Tools and Techniques : Environmental Scanning for business opportunity identification Opportunity Selection : Convergent Thinking Mode : Tools and Techniques

UNIT - III (06Hours)

Business Plan

Meaning and Importance – Objectives – Selections Contents – Marketing and Technical Feasibility – Financial Viability market survey techniques, marketing viability of the product, and typical areas of Civil Engineering.

UNIT - IV (06Hours)

Finance and accountancy

Finance and accountancy: working capital and fixed capital assessment incentives from financial institutions and government, financial ratios, their significance,break even analysis cash flow charts financial statements.

UNIT - V Project Report (06Hours)

Project report: Preliminary and final project report preparation, financial technical commercial and economic viability project implementation process project profiles with respect to Civil Engineering

UNIT - VI (06Hours)

Marketing Management

Introduction to marketing management, contract management and sales promotion.Motivation risk and its analysis goal settingdecision making. Communication skills effective communication and barriers.

Assignments:

1. Case study for Present scenario of Entrepreneurship development in India.
2. Assignment based on business plan preparation.
3. Develop a market survey format and carry out a market survey.
4. Prepare financial report of any constrction project.
5. Prepare a project report for any small construction project
6. Prepare marketing proposal for a construction project.
7. Study of any one of Entrepreneure biography.
8. Student are expected to study the assistance scheme of the following Institutions

   District Industries Center (DIC)

   Maharashtra Center for Entrepreneurship Development (MCED)

   National Small Industries Corporation of India (NSIC)

   Maharashtra Industrial Development Corporation (MIDC)

   Micro Small and Medium Enterprises (MSME)

Term Work:

1. Visit report : Shudent shall visit a small scale industry, study the working of the industry and write a report on that.
2. Prepare a detailed report for construction industry.

Text /Reference Books:

1. Small Scale Industry Handbook – Jay Narayan Vyas, Published by Granthvitaran, Ahmedabad
2. Entrepreneurship for the Nineties – Gordon B. Baty published by Prentice Hall Inc. College Technical Reference by Granthvitaran

3. Self-made Impact making Entrepreneurs – published by Entrepreneurship Development, Institute of India Bhatt. P.O. Chandkhed, Dist. – Gandhinagar
4. Entrepreneurship : New venture creation by David Holt Prentice Hall of India Pvt. Ltd. Latest Edition
5. Entrepreneurs Talent Temperament Technique by Bill Bolton and John Thompson- 2nd Edition-Elsevier
6. Dynamics of Entrepreneurship Development – Vasant Desai.
7. Innovation and Entrepreneurship – Peter F. Drucker

Syllabus for Unit Test:

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 E : HYDRAULIC STRUCTURES

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
Practical: -2 Hours /Week	Continuous Assessment: 40 Marks	
Tutorial: --	Term Work and Oral: -- Marks	Term work: 1 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Fluid and Soil Mechanics
2. Water Resources Engineering

Course Objectives:

Students will study uses and design hydraulic structures.

Course Outcomes:

On completion of the course, the students will be able to:

1. Describe and design weirs on permeable foundations
2. Design channels by different methods.
3. Describe various types of canal outlets and regulation works
4. Describe and design cross drainage works
5. Describe and design river training works .
6. Describe causes , effects and measures to control water logging.

UNIT – I (06 Hours)

Diversion Head works

Introduction, types, components, weir and barrage, causes of failure of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, silt control devices.

UNIT – II (06 Hours)

Canals

Introduction, Classification of irrigation canals, canal network, canal alignment, losses in channels, design of unlined channels by silt theories, Kennedy's and Lacey's theory, tractive force theory, losses in channels, Lining of channels types and economics.

UNIT – III (06 Hours)

Canal outlets and regulation works

Introduction , requirements of good outlets, types of outlets, Canal regulation works, necessity and location of falls, types of falls, cross regulator and distributary head regulator.

UNIT – IV (06 Hours)

Cross drainage works

Introduction, types, classification of aqueducts and siphon aqueducts, design of cross drainage works, determination of maximum flood discharge, determination of waterway of drain

UNIT – V (06 hours)

River training works

River training and its objectives, classification of river training works, Marginal embankment or levees, guide banks, spurs , types of spurs, design of guide banks and spurs.

UNIT – VI (06 Hours)

Water logging and its control

Introduction , causes and effects of water logging, measures for prevention of water logging, open and closed drains, reclamation of saline and alkali soils.

Assignments:

1. Problems on Bligh's and Khosla's theory
2. Design problems on Kennedy's and Lacey's theory.
3. Design of any one type of fall
4. Design of head regulator
5. Design of aqueduct/ siphon aqueduct.
6. Design of guide banks /spurs.
7. Case studies on uses of spurs
8. Case studies on drainage of water logged areas

Text Books:

1. Dr. P.N. Modi "Irrigation Water Resources and Water Power Engineering " , Standard Book House.2014
2. S. K. Garg "Irrigation Water Resources and Water Power Engineering" Khanna Publishers, 2006.

Reference Books:

1. Garde R.J. and Rangaraju K.G. ," Sediment transport and river Engineering" New Age International Publishers, 2006

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

54 F: SOCIAL AND LEGAL ASPECTS IN CIVIL ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 3Hours / Week	End Semester Examination: 60 Marks	Theory: 3 Credits
Practical: 2Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50Marks	Termwork: 1 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Building Planning Design and Byelaws.
2. Project Management.

Course Objectives:

To make students understand applications of social and legal aspects in civil engineering construction and professional practice.

Course Outcomes:

On completion of the course, the students will be able to:

1. Forms of business associations, their liabilities and their governing principles.
2. To understand difference between executional policies of public and private projects, types of organization structures & their bidding processes.
3. To understand laws of contracts, contract classification, types of agreements, safety legislation, health laws
4. Interprete contracts, understand conflict resolution, performance disputes, arbitration etc.
5. Learn social aspects like neighboring land owner rights, byelaws regarding growth & control, environmental aspects etc.
6. Understand intellectual property rights related to patents, copyrights & trade secrets.

UNIT - I (6 Hours)

Title- : FORMS OF BUSINESS ASSOCIATION & EMPLOYMENT

Sole proprietorship, Partnerships, authority & liability of partners, Profit corporations & non-profit corporations, Professional corporations, Limited Liability Partnerships (LLP), Limited liability companies (LLC), Joint Ventures.

Agency & employment - Policies behind agency concept & relationship, Employment relationship & workers compensation, Union & labour disruptions, Independent contractors, Labour laws - overview

UNIT - II (6 Hours)

PROJECT ORGANISATIONS

Public versus Private projects, Pricing types & delivery schedules. Turnkey Contractors- design & build project alliance, Public Private Partnerships (PPP), Build Operate & Transfer (BOT), Building Information Modeling (BIM), Competitive bidding process, Lean project delivery

UNIT - III (6 Hours)

CONTRACTS & CONSTRUCTION PROCESS

Contract formation, defects in contract formation, contract classification. Agreements- Memorandum of Understanding (MoU), Letter of Intent (LoI), Breach of contract, remedies for contract breach, limits on recovery, Law of Tort, Limits on tort liability.

Basic types of contracts, Public versus Private owner, Prime contractor, Sub-contractor. Purchase orders, Insurers, sureties, Permits, Building codes, safety legislation, Occupational safety & health laws, Responsibility of consultant, professional standard & compliance, ownership of drawings & specifications. Suspension, abandonment & termination clauses.

UNIT - IV (6 Hours)

PERFORMANCE DISPUTES

Contract interpretation, contractor claims, owner claims, contractor defenses to claims, resolving conflicts and inconsistencies, differing conditions, changes, design liability, Project delays and accelerations, time & duration of extension, notices, Warranty (Guarantee) clauses, bonus/penalty clauses, Contractual indemnity, Insurance, Arbitration, mediation & dispute resolution, Termination of contract.

UNIT - V (6 Hours)

SOCIAL ASPECTS & ENVIRONMENTAL LAWS

Urban & rural social transformation and their impact on social life, Housing as social security and important land use component, role of housing in development of family & community wellbeing, Land use provisions, economic concepts of land pricing, demand forecasting for land use, factors affecting land supply and demand.

Environment restrictions & limitations on land use control. Historic & landmark preservation. Open space & National Environmental Policy act. Resource conservation & recovery act. Clean water & clean air act. The environment friendly design and construction.

UNIT - VI (6 Hours)

INTELLECTUAL PROPERTY RIGHTS

Ideas, Copy rights, Patents & Trade secrets

Nature of Intellectual property - Patents, Designs, Trademarks & copyrights, availability of legal protection, duration of protection. Process of patenting & development for Technological Research, Innovation, Patent rights, Licensing & Transfer of Technology, Patent information and data base.

Assignments:

1. Distinguish between forms of business associations, their liabilities and their governing principles.
2. Explain the policies of public and private projects, types of organization structures & their bidding processes.

3. Short note on Turnkey Contractors- design & build project alliance
4. Explain Laws of contracts, contract classification.
5. Documentation in contract formation, defects in contract formation
6. Short note on Arbitration, mediation & dispute resolution.
7. List various social laws and explain Historic & landmark preservation
8. Explain land zoning – Byelaws for land use control.
9. Explain in brief Intellectual property, Patents-Designs, Trademarks & copyrights
10. Explain with flow chart Process of patenting.

Term Work:

1) Collection And analysis of data for different business association.
2) Application of Building Information Modeling (BIM).
3) Classification of contracts.
4.) Case study on arbitration.
5.) Different types of laws related to property and environment.
6.) Application of intellectual property rights.
7) Write case study on: Build Operate & Transfer (BOT), Public Private Partnerships (PPP)

Text Books:

- BIM and construction management Brad Hardin,Dave Mccool.
- Fundamentals of Engineering Economics-Pravin Kumar, Wiley, India.

Reference Books:

- BIM and construction management Brad Hardin,Dave Mccool.
- Prabuddha Ganguly, "Intellectual Property Rights",Tata Mc-Graw Hill.

- Fundamentals of Engineering Economics-Pravin Kumar, Wiley, India.

  Arbitration, Conciliation and Alternative Dispute Resolution Systems-Dr S.R. Myneni-2004 Edition, reprinted in 2005 –Asia Law House Publishers.
- The Indian Contract Act (9 of 1872) Bare Act-2006-Professional Book Publishers.

Syllabus for Unit Test

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

54 G: ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS

TEACHING SCHEME	EXAMINATION SCHEME	CREDITS ALLOTTED
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Term work: 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Applied Geology
2. Basic Science

Course Objectives:

To make students understand strength and water tightness of rocks, treatments given to the rocks. Decide foundation level for dams, bridges and alignment of tunnel.

Course Outcomes:

On completion of the course, students will be able to:

1. Discuss engineering geology of Deccan trap basalt.
2. To determine occurrence of ground water.
3. . Explain tail channel erosion.
4. Decide alignment of tunnel with reference to nature and structure of rock
5. Discuss process of soil formation
6. Decide different treatment to tunnel and foundation of civil engineering structures using rock mechanics.

UNIT - I (6 Hours)

Introduction and Engineering geology of the Deccan Trap

Importance of geological studies in engineering investigation, Precautions necessary to avoid misleading conclusions likely to be drawn while interpreting drilling data with particular reference to RQD. .Case histories illustrating economics made possible by proper geological studies and wasteful expenditure or difficulties resulting from their neglect. Engineering characters of rocks of major rock formations of India. Engineering geology of the Deccan Trap Basalts: Stratigraphy of Maharashtra, Varieties of Basalt, Field Characters of flows, regional distribution of Deccan trap rocks. Factors affecting strength and water tightness, Stability of cuts and ability to stand without support. Significance of commonly occurring features like gas cavities, Jointing, Weathering, Hydrothermal alteration, Volcanic breccias, Tachylytes, Dykes, Fractures.

UNIT - II (6 Hours)

Deccan Trap Basalt as Construction material and Ground water conditions in Maharashtra

Deccan trap basalt as construction material, Use of compact basalt and amygdaloidal basalt as rubble for masonry and metal for concrete.

Ground water conditions in Maharashtra with reference to Deccan trap area. Water bearing characters of different types of basalt, volcanic Breccia's, Tachylytic basalt, Dykes, Fractures, Weathering products and older alluvium. Geological factors governing natural recharge. Geological aspects of multi aquifer system. Geological aspects of conservation of water and artificial recharge. Dependence of success of such schemes as percolation tanks and water shed development on geological conditions and necessity of geological studies for such schemes. Study of case history.

UNIT – III (6 Hours)

Dam, Foundation Treatment, Tail Channel & Geomorphology

Dams: Strength and Water tightness of Deccan Trap rocks from foundation point of view. Physical properties such as compressive strength, Water absorption .Effect of weathering and hydrothermal alteration on the engineering properties of rocks. Deterioration of rock masses on exposure to the atmosphere and suitable treatment for such rocks.

Foundation Treatment:

Determining of foundation levels of gravity dams and cut off levels for earth dams. Correction of adverse features by means of grouting, Consolidation grouting for improving strength of weak and fragmented rocks. Curtain grouting for preventing leakage through foundation rocks. Foundation Treatment for fractures, jointed rocks Tachylytes , faults and dykes.

Tail Channels:

Erosion of tail channel as a factor in selecting site for spillway .Causes of rapid erosion of tail channels of side spillways.

Geological conditions leading to tail channel erosion, case histories. Suitable treatment.

Geomorphology:

Geomorphologic Studies for Reservoir, Different parameters of geomorphology, stream order, stream length, drainage pattern, drainage density and bifurcation ratio etc., Application of these studies.

UNIT - IV Tunnel and Bridges (6 Hours)

Preliminary geological investigation for different types of tunnels, Difference in behavior of basalts because of jointing as exemplified by compact basalt and amygdaloidal basalt, Difficulties introduced by tachylytes, Volcanic breccias, Tuffs, fractures, Dykes, Hydrothermal alteration,

Investigation for bridge foundations,. Computing safe bearing capacity (SBC) for bridge foundation based on nature and structures of rocks. Foundation settlements, Case histories.

UNIT - V Geology of Soil formation (6 Hours)

Residual and transported soil. Rock weathering conditions favorable for decomposition and disintegration. Influence of climate on residual and transported soil in Deccan trap area. Nature of alluvium of Deccan traps rivers and its engineering characters. Effect of decomposition of calcium carbonate. Scarcity of sand in the river in Deccan traps area. Geophysical Investigations: Electrical resistively methods of exploration as applied to engineering investigation.

UNIT - VI (6 Hours)

Rock Mechanics

General principals of rock mechanics, physical and mechanical properties of Deccan trap rocks. Calculating RQD, Joint frequency index, RMR, RSR, Q-system, standup time calculations, Bieniawski's geomechanical classifications and Bickhems Rock Classification.

Assignments:

1. Identification of Varieties of Deccan Trap Rocks.
2. Various Foundation Treatments.
3. Tunneling in Hard Rock
4. Tunneling in Soft Rock
5. Basalt as construction Material.
6. Calculation of RQD and RMR.
7. Types of Drainage Pattern with studies of streams.
8. Study of Toposheet (Any One for Geomorphology)
9. Calculation of Geomorphological Parameters as per the requirement of Reservoir estimation.
10. Weathering and Soil formation.

Term Work:

1. Construction of Geological section for dam site using drilling data.
2. Construction of Geological section and locating fault by angle holes.
3. Construction of Geological section and limitation for drilling.
4. Dams on Deccan trap rocks.
5. Tunnels and road cuts in folded sedimentary rocks.
6. Tunneling in Deccan trap rocks.
7. A report to be prepared on actual site visit for Major Civil Engineering Structures.

Text Books:

- Engineering Geology by Dr. .R.B. Gupte.PVG Pune
- Engineering and general Geology by Parbin Singh.
- General and Engineering Geology by Dr P. T. Sawant, New Delhi Publication.

Reference Books:

- Bartons, N.Lien,R.and Lunde, J.1974,"Engineering classification of Rock masses for the Design of Tunnel Support", Rock Mech.vol.6,No.4.
- Bieniawski Z.T1973,"Engieering classification of jointed rocks Masses",Trans.S African Instn.,Civil Engineers.,Vol.15,NO.12,p.p3354-344.
- Bieniawaski Z.T.1988,"Rock Mass Rating System In Egineering Practice-Symp on Rock classification Systems for Engineering Purposes ASTM",STP 984, PP1734.
- Gupte.R.B (1994),"PWD, Hand –book chapter-6 Part II Engineering Geology Government of Maharashtra."
- Goodman: Rock Mechanics.

Syllabus for Unit Test

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

54 H: DEVELOPMENT ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	Termwork: 01 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Surveying and Advanced Surveying
2. Engineering Economics

Course Objectives:

To give exposure and insight on governance and development problems particularly at rural level and to develop new, innovative methods and solutions to existing problems in rural areas.

Course Outcomes:

On completion of the course, the students will be able to:

1. The students can take hands on research on real world problems and deliver solutions.
2. develop multi scaled perspective about decisions in the built environment
3. expose the students to the analysis and evaluation of real world problems aiming to bring desired change in the society.
4. understand the government policies
5. understand the various government schemes
6. Describe importance of people participation in development projects.

UNIT - I (06 Hours)

Introduction to Development Engineering

Need of development at rural level, development deficit, socioeconomic development, issues and challenges associated with drinking water, waste water treatment, electricity, public transport, irrigation, Sanitation and non-conventional energy sources. National and state level policy.

UNIT - II (06 Hours)

Initiatives of GOI and Maharashtra State

Initiatives of GOI and Maharashtra State Various schemes for Rural Area like Jalyukta shivar, Sansad Adarsh Gram Yojana, Model village or Smart village concept, PMGSY,CMGSY, Unnat Bharat Abhiyan, Unnat Maharashtra Abhiyan, and other schemes for rural areas. Water shed development projects.

UNIT - III (06 Hours)

Life cycle costing of various schemes

Life cycle costing of various schemes Different phases in the schemes and projects, cost benefit analysis, environmental analysis of the project.

UNIT - IV (06 Hours)

Field work and reporting

Field work and reporting Primary data gathering tools such as Delphi methods and other methods, Assessment of existing schemes in rural area and possible problem identifications in existing scheme

UNIT - V (06 Hours)

Geographic Information Systems (GIS)

Introduction to Geographic Information Systems (GIS), Advantages and benefits, various GIS software's, Interdisciplinary applications of GIS, Integrated use of GIS with GPS and remote sensing, mapping and preparation of layouts.

UNIT - VI (06 Hours)

Social Impact Assessment

PRA, RRA. The basics of PRA-The Demand side: House hold surveys, Drinking water and irrigation water. The supply side: Resource map, assets, institutions and allocation documents, time line, changes in crop and welfare.

Assignments:

1. Assignment based on challenges associated with drinking water
2. Assignment based on challenges associated with waste water
3. Assignment based on challenges associated with public transport
4. Assignment based on challenges associated with sanitation
5. Assignment based on initiatives by GOI and Govt. of Maharashtra for development
6. Assignment based on activities under Unnat Maharashtra and Unnat Bharat Abhiyan
7. Assignment based on assessment of existing schemes in rural area.
8. Assignment based on use of GIS in development process of rural area
9. Assignment based on PRA & RRA

Termwork:

1. Study of any one development project from urban area in progress
2. Visit report of any one development project in rural area in progress
3. Impact assessment of development projects
4. Use of GIS for development project
5. Cost benefit analysis of development project

Text Books / Reference Books:

1. Geographic Information Systems and Science, Second Edition 2005: Longley, Paul A., Michael F. Goodchild, David J. Maguire, David W. Rhind, John Wiley & Sons, New York.
2. Chand, M. and Puri, U.K.(1983),'Regional Planning in India', Allied Publishers, New Delhi.
3. Kaiser, E. J., et.al. (1995), 'Urban Landuse Planning', 4th (ed) Urbana, University of Illinois Press.
4. Sundaram, K.V. 1985 'Geography & Planning', Concept Publishing Co., New Delhi.
5. Desai, V. (2005), 'Rural Development of India', Himalaya publishing house, Mumbai.
6. Rau, S.K. (2001), 'Global Search for Rural Development', NIRD, Hyderabad.
7. Longley, P. A., Michael F. Goodchild, Maguire, D.J., Rhind, D. W. (2005), 'Geographic Information Systems and Science', Second Edition 2005: John Wiley & Sons, New York.

Syllabus for Unit Test:

Unit Test -1 UNIT – I, II, III

Unit Test -2 UNIT – IV, V, VI

55: PROJECT STAGE II

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Practical: 06 Hours / Week	Term Work and Oral: 100 Marks	Termwork: 08 Credit

Course Pre-requisites:

The Students should have knowledge of

1. Engineering Mathematics
2. Written and Communication skills
3. Analytical skills
4. Project planning and design

Course Objectives:

The student shall be able to identify the problem and suitable solution for the same.

Course Outcomes:

On completion of the course, the students will be able to:

1. Design the experimentation for the work.
2. Analyse the results of the work
3. Decide the conclusion and suggestions for the work.

UNIT - I

Stage-II

The Project Stage-II will be the work in continuation of Project Stage-I .No change on the topic of Stage-I is allowed.

Stage-II:

It consists of completing the experimentation/design/model work of the problem/ topic defined in Stage-I.

Preparing a detailed project report in specified format. The report shall be consisting of work completed in Stage-I, observations, results and conclusions of the problem/topic selected.

Oral : Oral shall be based on above termwork and a presentation on it.

RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

Standards of Passing and ATKT Rules

1. For all courses, both UE (Universtiy Evaluation) and IA (Internal Assessment) constitue separate heads - of - passing (HoP). In ordar to pass in such courses and to 'earn' the assigned credits.
   a) The learner must obtain a minimum grade point of 5.0 (40 % Marks) at UE and also a minimum grade point of 5.0 (40 % Marks) at IA.

   OR

   b) If he/she fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for course is atleast 6.0 (50% Aggregate). The GPA for a course will be calculated only if the learner passes at the UE.
2. A student who fail at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, A student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

Rules of ATKT

1. A student is allowed to carry backlog of courses prescribed for B.Tech Sem - I, III, V, VII to B.Tech Sem - II, IV, VI, VIII respectively.
2. A student is allowed to keep term of Sem - III, if he/she is failing in any number of subjects of Sem I & II.
3. A student is allowed to keep term of Sem - V, if he/she is failing in any number of subjects of Sem - III & IV but passed in all subjects of Sem - I & II.
4. A student is allowed to keep term of Sem - VII, if he/she is failing in any number of subjects of Sem - V & VI but passed in all subjects of Sem - III & IV.

Award of Class for the Degree Considering CGPA

Award of Honours

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The Criteria for the Award of Honours at the End of the Programme are as given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 ≤ CGPA ≤ 10.00	0	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤ CGPA ≤ 9.49	A+	Excellent	70 ≤ Marks ≤ 80
8.00 ≤ CGPA ≤ 8.99	A	Very Good	60 ≤ Marks ≤ 70
7.00 ≤ CGPA ≤ 7.99	B+	Good	55 ≤ Marks ≤ 60
6.00 ≤ CGPA ≤ 6.99	B	Average	50 ≤ Marks ≤ 55
5.00 ≤ CGPA ≤ 5.99	C	Satisfactory	40 ≤ Marks ≤ 50
CGPA Below 5.00	F	Fail	Marks Below 40