BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Engineering & Technology
B. Tech (Electrical & Computer)
New Syllabus

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY) Pune.

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

 

21-22)Manual1.

Sr. No	Parameter/ Dimensions	Department Responsible
1	Executive Summary	Electrical
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5.1	Courses-Theory/Practical's/Tutorials/Units/Co-mapping and Engagement , University exam and internal assessment	Computer
5.2	Credit Concepts- Equivalence	Mechanical
5.3	Vocational Courses - Objective, Hrs./Cr/Methodology, Assessment type, Record, Format for credit allotment/ Credit certificate/ Singing authorities.	ECE
5.4	Industry Taught Courses - Objective/Credit/Hrs. methodology, Approval format for expenditure, Request format for experts, Acceptance, Agreement time table, Display, Assessment - Theory/ Practical, Record, Bill format, Payment record.	ETC
5.5	NPTEL Courses - Objective- Methodology As sessment- Certificate- Credit certificate -Competent authority - Record.	Electrical
5.6	Projects (I & II) - Objective- Hrs./Credit, Description of stage I & II, Assessment evaluation, Format for TW evaluation and oral evaluation.	Mechanical
5.7	Social activity, assessment format, credit allotment, credit certificate	IT
5.8	Research paper	Chemical
5.9	Internship	Chemical

Executivesummary

Students pursuing engineering studies need to be well equipped and state ofartwiththelatesttechnologicaltrendsandindustrialrequirements.Toproduce the students with high caliber and technically sound, enrichment in the curriculum content and various quality initiatives are needed. This is possible onlywhenthestudentsundergostudieswithanupdatedandevolvingcurriculum to match global scenario.

CurriculumDevelopmentHistory

- InambitsofDeemedUniversity-2000
- CurriculumofSPPUAccepted
- FirstRevisionin2004
- SecondRevisionin2007
- ThirdRevisionin2011
- FourthRevisionin2014
- FifthRevisionin2018wasexpected

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,onecoursepersemesterwillbeentirelydeliveredbytheexpert/sfromthe industryofrespectivefieldforwhichblendedteachinglearningwillbeadopted.

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

Togivetheexperienceoftechnicalwritingandresearcharticle,studentshaveto developthetwoprojectsinprefinalandfinalyearrespectivelyandshallsubmit theresearcharticletoreputedjournalforpublication.Thiswillinculcateresearch aptitude among students and will enhance the research profile of institute also. Incorporation of various practical based courses in respective discipline, will give handsonexperiencetostudentstounderstandtheengineeringconceptinbetter way.Nowadaysallpracticesandprocessinthefieldarebeingcomputerizedand automated.Hence,itwaspertinenttoincreasesoftwarecontentinthecurriculum. Itwasdemandfromtheindustrythateveryengineershouldbeconversantwith 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 amongstthestudents,proposedcurriculumhasintroducedMassiveOpenOnline Coursestoallthestudentstoprovideanaffordableandflexiblewaytolearnnew skills, advance the career and deliver quality educational experiences at scale.

2. CurriculumContent

- Curriculum derived from Latin word 'Currere', which means a race course or runway on which one runs to reach a goal.
- Curriculumistheinstructionalandeducativeprogrammebyfollowing students achieve their goals, ideals and aspirational life.
- Curriculumisastandardsbasedsequenceofplannedexperiences,

  which studentspractice and achieve proficiency in content and appliedlearning skills
- Itsconfidencebuildingprocess
- Itstotallearningexperienceoftheindividuals
- Itsinteractivesystemofinstructionsandlearningwithspecificgoals, contents, strategies, measurements and resources.
- Thedesiredoutcomeofcurriculumissuccessfultransfer/developmentof knowledge, skills, and attitude.
- Curriculumshouldleadtotransformationofstudenttocontributorymember of the society

  Wetriedtodevelopcurriculum,whichwillmeettheseconcepts.

Curriculumistheoutlineofconceptstobetaughttostudentstohelpthemmeet thecontentstandards.**Curriculum**iswhatistaughtinagivencourseorsubject. It refers to an interactive system of instruction and learning with specific goals, contents,strategies,measurement,andresources.Itisacourseofstudythatwill enablethelearnertoacquirespecificknowledgeandskills.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 tobringoutandevaluatethetargetlearningoutcomesofaparticularcourse.Itis thegoals,assessments,methods,andmaterialsusedtoteachaparticularskillor subjectandincludesthinkingunder"skill.".Thecurriculumneedstobeplanned

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 satisfytheneedofgoodplacement.Thewrittencurriculumisaplanofwhatisto betaughtsothatthestudentgetsgoodplacement.Forthis,avarietyoftechnical 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 alsoinclude social behaviors as well as content and thinking skills.

Overall,thecurriculumshouldbesuchthatitshoulddevelopastudentinagood 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. CurriculumPreamble

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 onlineandofflineteachingisapartofthecurriculum.Inordertodevelopaffection towardsthedisciplineastudenthasselected,corediscipline coursesareincluded rightfromfirstyear.Thiswillalsohelptogivetheoverallideaaboutthebranch /disciplinetothestudent.

Interactionwiththeindustryisincreasedinthiscurriculumbyintroducingtwo new concepts –

1.**VocationalCourse**and2.IndustryTaughtCourse.

VocationalCourse(VC),astudentwillabletodevelopaspecificskillsetfromthe relevantpeople/agencyfromtheindustry.Thiswilladdingainingnewskillsets requiredbytheindustry.SuchVocationalCoursesareincludedfromSemesterIII to Semester VI of the curriculum. Department also design vocational course relevant for the discipline, which add practical knowledge to students. The vocationalcoursesshouldbedisciplinespecific.4vocationalcoursesand8credits are integrated with curriculum.

Industry Taught Courses (ITC) are the courses which will be taught by the peoplefromindustrywhoareexpertsintherelevantfield,eitherpartiallyorfully. 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 willdevelopaconfidenceamongthestudents.Suchteachingbyindustryexperts will be as per their availability, if required online and other than official college hoursalso.Thus,thereisablendofonlineandofflineteaching,knowledgefrom 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,willalsoaddtotheinteractionwiththeindustry.Astudentwillavail histraininginindustryoronsiteorinanydesignofficeorresearchorganization asallottedtohim/bytheinstitute.Aseparatelogbookwillbemaintainedbythe student during this period duly signed daily by the competent authority.

ProjectBasedLearningisapartofalmosteachcourseofthecurriculum.Small projectsonrelevanttopicswillbeallottedtothestudentsasapartofterm-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.

PublicationofaresearchpaperistheoutcomeexpectedfromtheProjectwork andasamotivation,separatecreditsareallottedforthis.Studentsareexpected towriteresearcharticlebasedonProject-Iinstandardjournalsinfinalyear.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**coursesandwillgetthecertificationoftherespectivecourse.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 includedeachinSemesterIII,SemesterVandSemesterVIIandseparatecredits are allotted to it.

Various new courses are introduced in the curriculum thereby introducing the currentandlatesttechnologytostudents.BasicScienceandEngineeringScience coursecontentsaredesignedtomatchtherequirementofthespecificdisciplines.

Numberofsoftwarerelatedtothatbranch/disciplineareincludedaspartofthe curriculum. This will help the students to get good placement.

Fewsoftcoursesareintroducedtonon-circuitbranches.Thiswillgiveasoftfeel to such branches and also to inculcate confidence among the students.

Inadditiontotechnicalabilities,astudentneedstobedevelopedasagoodhuman 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.

Recommendationsconsidered

- UGC-Qualitymandate
- NationalEducationPolicy(NEP)

- AICTEmodel curriculum
- CurriculumofInternationalUniversities
- CurriculumofIndianUniversities
- FeedbackfromHRofindustriescalledforplacements
- Marketperception

MethodologiesAdoptedInDesigningCurriculum(2021-22)

- 19BasicPointsfordesignofCurriculum
- Listingofcommonpoints(credits,marks,No.ofcourses,commoncourses, industry taught courses, vocational Programmes etc.)
- Conductedseriesofmeetings
- ConductedindepthoneononediscussionswithHoDs
- Plannedthreeworkshops,
- EminentexpertsfromIndustry,IITs,IISER,NIT,SPPU,CentralUniversities were invited for workshops
- Firstworkshop- Coursestructure,Titlesofcourses,Industrytaught courses, Vocational Courses.
- Secondworkshop-Contentoffirstandsecondyearcourses
- Thirdworkshop-Contentofthirdandfourthyearcourses-(Planned)

4. Salient features

- Total250contacthoursteachingareincorporated.
- Creditbased38theorycoursesbeingofferedtoachieveglobalstandardsof quality.
- Curriculumofferspracticalstomorethan80%(~30theorycourses)theory courses.
- Total230credits(6500marks)areofferedfortheentireB.Tech. programme.
- Theorycoursescontains60%ofcoursesand20%topracticalcourses.
- Tutorials (6 Credits), online courses (6 Credits), vocational courses (6 Credits),projects(18Credits),internship(3Credits),ResearchPublication (2Credits)andsocialactivitiesassigned(4Credits)containsremaining20% 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.
- 60daysindustrialinternshiptomeettherequirementsofindustry.
- Includingof2projectstoenhancetechnicalskills&selflearning.
- Research paper based on Project-I will inculcate research aptitude among students.
- Projectbasedlearningpracticallyforallcourseswillenhancetheabilityof application of knowledge and problem solving aptitude.
- NPTEL/MOOCcoursesinonlinemodeareintroducedasintegratedpartof the course structure.
- To understand social responsibility and social activities of weightage of 4 credits are integrated part of the course structure.
- QuantitativeTechniquesandcommunicationcoursesareintroducedto 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. CurriculumDetails

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-GraduateProgramme(B.Tech)isoffouryearsdurationi.eofeightsemesters(two semesters/year).

EngagementofCourses:

The courses in revised curriculum structure of B.Tech. program are categorized under Core courses, Elective courses, Engineering Science courses and Basic Sciencecourses.Thesecoursesaretaughttostudentsbyengagingthemthrough lectures,practicalortutorialsbyrespectivecoursecoordinators.Fromsemester ItoVI,therearefive(lectureengagedandassessed)coursesandinsemesterVII and VIII there are four (lecture engaged and assessed) courses which are mandatory.Allthecourseshavevaryinghoursofengagementandcredits.Theory lecture engagement varies between 3 hours to 4 hours/week, practical engagementvariesbetween2hoursto4hours/weekfortherespectivecourses. Thecontentsofeverycourseisdividedintosixunits.Eachunitcanbecoveredin 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.

OutcomeBasedCurriculum:

Planning and realization of teaching and learning related to outcome-based curricularmodelrequiresthatinitialelementshallbeanoutcome.Itservesasa basisfordefiningmodesofevaluationandvalidationofoutcomes.Thecurriculum 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.

CreditCalculation:

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:

NumberofCreditsforTheory(Th)courses=Numberofclassroomteachinghours 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.

ExaminationPattern:

A) UniversityExamination(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 assessmentisdividedintothreeassessmentheadsviz.Termwork(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) InternalAssessment(IA)

The Internal Assessment (IA) for the respective courses will be performed throughUnitTests(UT)andAssignments.TotaltwoUTsof20markseachwillbe

conductedandtheaveragemarksofthesetwoUTswillbeconsidered.Similarly, coursecoordinatorswilldesigntheclassassignmentsintermsofexercises,case studies,realworldproblemsorminiprojects,whichthelearnershavetosubmit 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. Iftherearemultipleassignments,thentheaverageofscore(fromscoreattained 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:

IAScoreattainedbylearner(Max40)=AverageScoreattainedinUTs(Max 20) + Score attained in Assignments (Max 20)

5.2. CreditConcept:Equivalence

InCBCS2021Coursestructure,theallotmentofcreditsareasfollows: Theory class of 1 hour: 1 Credit

Practicalclassof2hours:1Credit Tutorial class of 1 hour: 1 Credit

Project,ResearchPaper&SocialActivity:1Credit

5.3. Vocationalcourse

Vocationallearningopportunitiesplayaimportantroleinskilldevelopmentand employability of student. Vocational courses are ways of implementation of theoreticalknowledgeinthepractice.Theimportanceofvocationaldevelopment can largely be summed up as the difference between theoretical knowledge vs. practicalskills.Thevocationalcoursesarebasedontheteachingofpracticalskills. 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&objectivesofvocationalcourses:

- Toprovidestudentswithtechnicalknowledgeandskillsnecessaryfor progressive education in engineering profession.
- Togiveabetterunderstandingoftheemergingoftechnology.
- To train the student with necessary skills leading to skilled personnel who will be enterprising and self-reliant.
- Toenhancetheskillofstudentsforbecomingself-sustainedengineer.
- Toreducethemismatchbetweenthedemandandsupplyofskillman-power.

In this curriculum at B.TechProgramme, there are four vocational courses introducedi.e.inSemesterIII,IV,VandVI.Thecoursesofferedatthesesemesters 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 least4hoursperweek.Thetrainingsessionsshallbeorganizedonweekendsor on the extended hours of the college timing.

Afaculty-in-chargewillbeappointedtomonitorthefunctioningofthevocational

courseaswellasmonitortheperformanceofthestudentforthesaidcourse.

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 shallbeintheformoftermworkandoral.Thetermworkandoralcarry50marks. Thecandidateperformanceshallbeevaluatedbasedonthetrainingundertaken bythecandidatethroughoutthesemester.Studentshallgivepresentationofskills helearnedthroughvocationalcoursesfollowedbyviva.Externalexaminerforthe same shall necessarily from relevant industry.

Atotalof2creditsshallbeallottedpervocationalcoursepersemester.

Certificate:

Everycandidateshallbeawardedacertificateaftersuccessfulcompletionofthe vocational course as per the rules & regulations.

Thecertificateshallbejointlysignedbyconcernedauthoritiesofcollegeandthe company.

5.4. IndustryTaughtCourses

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. Impartthestate-of-arttechnologycourseexistingintheindustry.

ii. Exposestudentstoapplicationoftechnologiesadoptedbyindustry.

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

iv. Makestudentsdrawbenefitfromtheexperienceofveteransfromindustry. Knowledge sharing by industry experts.

v. Alignstudent'smind-settowardsindustrialenvironmentthroughthe instructor from industry. Provide industry instructor lead courses.

CREDIT/HRS.:

PercentageofIndustryTaughtCoursesintheprogramme=……%

METHODOLOGY:

A) Afacultyshallbeappointedascourseco-ordinator. Rolesand responsibilities of Course coordinator are as follows:

(i) ActasaliaisonbetweenidentifiedIndustryexpertanddepartment.

(ii) Arrangescheduleoflecturesinconsultationwithidentifiedindustryexpert.

(iii) Keeprecordofstudents'attendance.

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

(v) KeeprecordofUnitTestPerformanceandPracticalsalongwithexperts.

(vi) Organisevisittotheindustryrelevanttothecourse.

B) Execution:

(i) The Identified industry expert can conduct theory classes on weekends or asperconvenienceofIndustryexpertseitherthroughofflineoronlinemode.The courseswhicharetobetaughtbyexpertfromindustryarealreadyidentifiedand confirmed inworkshop-I

(ii) Practicalsessionswillbeconductedbycoursecoordinator.Panelofexperts 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.

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COLLEGEOFENGINEERING,PUNE–411043.

ApprovalformatforExpenditureforIndustryTaughtCourse

Date:

NameoftheDepartment: _____

1. Budgetary allocation for industry expert (As per Budget 2021-22) Please mentiontotalamount(inRupees)andotherbifurcations,ifmade----------(tobefilledatcollege level)
2. No.ofLectures(IndustryofferedCoursewise/Subjectwise)requiredwith 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									

RecommendationforCourseCoordinator
Recommendation for HoD
Recommendation for Principal

3. TotalfinancialOutlayforhonorariumofFaculty:(Industrytaughtcourses-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 **SignatureofPrincipal**

Request format-To Industry Expert

To

……

Subject:IndustryTaughtCourse(ITC)forB.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 CollegesofIndia,consecutivelyforfiveyears(99thrankingin2020)byMHRDin 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 magazineIndiaToday.DATAQUESTaleadingjournal,rankedBV(DU)COEPin3rd 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.

----Briefaboutdept-----

Thecoursecurriculumhasamulti-dimensionalapproach,itnotonlyimplements adynamic,qualitative,andevolvedstructureandsyllabus,butalsoincorporates agoodandhealthymixoftheoreticalandpracticalexposure.Inthisregardsthe institutepromotesandencouragescoursesinlinewithindustryexpectationsand forthcomingchallengeswhichshouldeasethestudentsforundergoingindustry 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.

Tofulfiltheseobjectives,curriculumdesign,whichwillbeimplementedfromthe academic year 2021-22, B.Tech. program includes 6 courses taught by industry experts.Withreferencetothesubjectmentionedabove,werequestyoutoteach… ….. 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 offlineteachingwhereverandwhicheverisbestpossible.Therefore,Irequestyou tosendacceptanceletter,modeofteaching,convenientdayandtimeslottoteach the said course. Enclosed please find herewith standard format for reply.

WithThanksand Regards,

SignandstampofHead,Deptof_____

Enclose:-Coursecontent

Reply

To

ThePrincipal

BV(DU)

COE,

Pune.

Subject:-Acceptancefordelivering/conductinglectureofthecourse---------- of B.Tech(-----),Sem(----).

Ref.:-Yourletter---------- dated-

Dear Sir,

Thishasareferenceofyourlettermentionedabove.Itgivesmeimmensepleasure 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>

<Nameof Expert>

BHARATI VIDYAPEETH
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COLLEGEOFENGINEERING,PUNE–411043.

Date:

AGREEMENTTIME-TABLE

Nameofdepartment:

Nameofindustrytaught course:

Sr. No.	Day	Date	Time Slot

(Name&sign.ofHODwithdate& stamp) (Name&Sign.ofConcerned Person)

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IndustryTaughtCourses(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.
- TotalassessmentofIndustryTaughtCourse-Theoryisof100Marks.
- AssessmentofthiscourseconsistsofInternalAssessmentandEndSemester Exam which carry 40 Marks and 60 Marks, respectively.
- InternalAssessmentconsistsofassignmentsandminiprojects.
- Onerealworldproject(miniproject)isconsideredaspartofInternal Assessment.
- Studentsshouldgivepresentationongiventopic.
- Industryexpertshouldsetquestionpapers.
- Incaseofpracticalexam,industryexpertcantakeoralexam(maybeonline) and students will perform the experiments in the presence of course coordinator in the department.

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B.Tech(BrachName)Sem__

Title of ITC: - _____

Record of Lecture Taken

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

BHARATI VIDYAPEETH
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BillformatforremunerationforIndustryTaughtCourses

(Thebillshouldbesubmitteddirectlytotheconcerneddepartmentonorbefore 5th of every month)

1. Nameofindustryexpert:_____
   Company/Industryname:
2. Name of the Department:_____
3. RemunerationfortheMonth:_____
4.

Name of the Bank	Branch	A/C No.	IFSC

5. ContactDetails:-

Email	Cell Phone No.

6. Detailsoflecturesdelivered:

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

Date:_____

_____

SignatureoftheIndustryexpert

Certified that hasbeenappointedbythe----- deptasanindustryexpertforthecoursevideorderNo._____

dated._____has delivered _____lectures/takenclassesduring the month/ Sem _____

andisentitledtohonorariumofRs._____(@Rs. ------ /-per lecture/perday)

Course Coordinator: _____

_____

SignatureoftheHeadoftheDepartmentwithSeal Date:

Receipt:-

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

SignatureofIndustryExpert

BHARATI VIDYAPEETH
(DEEMEDTOBEUNIVERSITY)
COLLEGEOFENGINEERING,PUNE–411043.

PaymentRecord
(CopytobemaintainedintheDepartment)

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) Collegevouchercopy
2) NEFT/RTGScopy

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 willprovideanaffordableandflexiblewaytolearnnewskills,advancethecareer and deliver quality educational experiences at scale.

Also,NationalEducationPolicyisinsistingtheOnlineandDigitalEducationand 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 interactiveuserforumsthathelpbuildacommunityforthestudents,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. Toprovidee-learningthroughonlinewebandvideocoursesinEngineering by experts in the country in that subject.
2. Todevelopself-learningattitudeinstudents.
3. To provide platform for knowledge enhancement of student's as per their area of interest.
4. Toupdatestudentswithadvancedtechnologies.
5. Tomakethestudentsmoreemployable.
6. TopreparethestudentsforcompetitiveexamslikeGATEandalsoforhigher studies.

Methodologyof Assessment:

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

- Studentsneedtoattendallonlinelecturesandcompleteallassignmentsas per schedule for registered course.
- Student will register and appear for exam conducted by NPTEL and shall submitthecopyofcoursecompletioncertificatereceivedafterpassingthe exam for registered course.
- Accordingly,thecreditswillbeallottedtothestudentforrespectiveMOOCs.
- Students have the flexibility to attempt the said course during the entire B.TechProgramme to earn the credits of respective MOOCs.
- NPTELcoursesrelevanttorespectivebranchareonlyexpectedtoselectby students. Credits will not be awarded if general/ non engineering courses opted.

5.6 Project I and II

ProjectStageIObjectives:

Providehelptothestudents

- Ingeneratinganewideaormodifyexistingsystemforsolvingsocietal, industrial and/or institutional problem.
- Inreviewofliteraturethatalignswithnewideaand/orexistingsystemsand clearly defining the problem
- Indevelopingaworkflowprocess/methodologyforthedesiredsystem.
- Indesigningvariouscomponentsofthesystemassembly
- IndevelopingaCADmodelofthedesiredsystem.
- Inwritingthetechnicalreportbasedontheworkcompleted

ProjectStageIIObjectives:

Providehelptothestudents

- In fabrication of the experimental setup/new system and/or purchase of standard components
- Inpilotrunand/orvalidationofnewsystemforitsperformance
- Inmodifyingthesystemifrequiredtoimproveitsperformance.
- In detailed parametric studies of the modified system and analyzing theresults
- Inwritingthetechnicalreport,researcharticleand/orfilingapatent.

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		
Assessment Tools	Assessed through	Marks
	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		
Assessment Tools	Assessed through	Marks
	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

ParametersforevaluationofprojectinUniversityexamination

1. Ideaof Project/Topic
2. Technicalcontent
3. Innovation
4. Experimentation/Model development/Software development/Simulation development etc.
5. ParticipationasanIndividual
6. ResearchPotential
7. ProjectHardware/Software
8. Fabrication/Model/Equipmentdevelopment
9. Data Analysis
10. Attendance
11. Timelycompletion
12. Reportwriting
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.

ProgressiveEvaluationRecord(PER)shallbesubmittedinthedepartmentatthe end of the semester and made available at time of university examination.

FormatforInternalExaminationforProject-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%)

FormatforUniversityExaminationforProject-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 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 consideredforassessmentoftheproject.Eachparameterwillcarry10marksfor Project-I & 20 marks for Project-II.

5.7 SocialActivitiesfortheLearners

A) Introduction

TheprimeobjectiveofBharatiVidyapeeth(DeemedtobeUniversity)Collegeof 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 alsohassucceededinbringingthenationupbyconnectingwithsociallyleft-out elements and bringing ray of hopes into their lives. In this respect, the new curriculumencouragesthelearneronthesocialactivities.Inthiscase,student's socialactivitiesareprovidedbythecolleges,butnotlimitedtothem.Totaloffour credits assigned for these activities.

B) Objectives

a) Tomakepeoplecreatebalances,sotheydonotonlyfocusonacademic aspects, but there can also be other aspects to have in life.

b) Tobuildbetterrelationshipwithothers.

c) Tocreategreatbalancewiththeacademicaspects.

d) Tolearnandunderstandsociety.

e) Todevelopthenatureofhelpandenhancetheethicalnormsforbehaviors.

f) Teamwork

C) OutcomeofSocial Activities:

Thesocialactivitiesmakeagoodimpactonlearners.Thelearner:

a) Willbeabletounderstandtheneedsofsociety.

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

b) Willbeabletounderstanddifferentperspectivesandengageothercultures.

Social events develop social skills and empathy—the outward-oriented dimensionsofemotionalintelligence(EQ).Theinteractionsorconversations 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) Willbeabletomaintainpositiveoutlooktowardslife.

With high adaptability to diverse situations and a good level of understandingofother'sopinions,sociallyawarelearnersarelesslikelyto 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) Willbeabletomaintaingoodemotionalhealth.

Social activities keep the learners sharp and mentally engaged, and this is important to prevent the onset of serious diseases like dementia or Alzheimer.Connectingwithothershelpskeepyouinapositivemood,which inturnwardsoffdepressionbyimprovingphysicalhealthandmaintaining good emotional health as well.

D) SamplelistofSocialActivities(notlimitedtothem)

a) OrganizingEducationalCamps

Educationalcampsmaybeorganizedforthesociallyandeconomicallyweek 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) TreePlantationDrive

Therearesomanyhealthbenefitstohavingplantsaround–likefresherair, improvedemotionalstate,andreductionofillnessinandaroundthesociety. 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) OfferHelpingHandforMartyrsFamilybyFundraisers

Soldiersfightforourcountry,securingourborders.Theydon'tthinkoftheir family and sacrifice their lives for us, and what we do for them? Packages areannouncedeverytimeafterthedeathofourworriersbutrarelyreaches them.Familieskeepwaitingforyears.Inthisregard,fewoftheseforgotten familiescanbevisitedandasmallhelpinghandcanbelendtothem,tomake themleadtheirfurtherlifepeacefully.Fundraisinginthisrespect,isagreat student society social idea. It is incredible to see how people can bring positivechangeiftheyworktogether.Theyouthcanmakeateamwithan

external organization to take part in a purposeful community event as mentioned above.

d) NationalServiceScheme

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 heightsintheirfield,whoarestalwartsindifferentfieldbutnevercameinto 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 stalwartsmaybelikeAnandKumarwhoteachesunderprivilegedstudents forIIT-JEEwithoutapenny,ShekharNaikwhoistheCaptainofIndianBlind 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) StreetPlayonSocialAwareness

Thisisalsotypicallyknownas"NukkadNatak".Thisformhasbeenusedto propagate social and political messages and to create awareness amongst thepeopleregardingsocialissues.Whatisimportantisthattheplaysmake 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 highlightcasteconflictsorideasabouthygieneandhealth.Streetplaysare 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, safetyissuesandrightsforwomen.childlabor,organ/humantraffickingetc., can be thought of. The learners can participate in street play festivals like Manthan Mahotsav, the largest street play festival in India.

g) PosterExhibitiononContributionsofHeroesofIndia

The learners can organize an exhibition to not only display but explain the contributionofIndianHeroeswhohavebeenforgottenandremainedinthe bookofhistory.SomeoftheseinspiringheroesmaybeMihirSen,KhashabaDada sahebJadhav,AnandibaiJoshi–FirstwomandoctorfromIndia,BhikajiCama, Khudiram Bose, Baba and Prakash Amte etc. Such exhibitions make inspired, the youth of today's generation.

h) WasteCleanDrive

i) Educating literacy-poor societies about disposal of nature-harmingobjects

j) Distributingneedfulitemsforlivingineconomicallybackward societies

k) Organizingearlycompletiononnationalissues.

l) CleaningofPublicPlaces/TrafficManagement/PoliceMitra.

m) Organizing activities under engagement of people with Science andTechnology.

Report of social activities conducted each student shall be prepared in standardformat.Appropriatedocumentaryevidencesshallbepartofreport ofstudentscorrespondencewithrespectiveauthoritiesforsocialactivities, 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 societybutalsoignitemindsofgenerationsaheadtoprovidetheirsupport 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.Theprimaryobjectiveofinternshipistomakestudentsfamiliar 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 mandatoryforstudentstoundergoin-planttrainingaftercompletionofsemester 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 ofdailyworkcarriedoutintheindustry,studentshallpreparearecordbook.This recordbookshallbecheckedandsignedbyhis/hersupervisorfromtheindustry where he/she is doing internship on daily basis.

Universityexaminationcarries50marksandaftersuccessfulcompletion,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,aspertheregulations.Internshipwillultimatelyassiststudentsto apply theory learned in classroom to industrial practices so as to understand engineering/technicalsolutionsinaglobal,economic,environmentalandsocietal context.

5.9 Researchpaperpublication

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

1. Ithasbeen&introducedin7thsemester.Twocreditsareawardedforthesame 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,Selectionofjournalforpublication,Submissionofmanuscripttothe 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 otherstudentsshallbeaddedwithoutanycontributioninresearch/projectwork. 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 publicationas a integrated part of the course structure, will inculcate research aptitude among students. This will help there in seeking admissionsinreputedInternationalUniversitiesforhigherstudies.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.

Weeklyprogressreportoftheresearchpaperpublication. Title

of the project -

NameoftheGuide-

Weeklyscheduleofmeeting-Day------- Time-----

StudentDetails- Name---------PRN------ RollNo.---

Sr.No.	WeekNo.	Date	Workcompleted/donebystudentsperweek

Vision of the Institute

To be World Class Institute for Social Transformation through Dynamic Education

Mission of the Institute

- To provide quality technical education with advanced equipments, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

Vision of the Department:

To develop electrical engineers with professional skills to suit global needs.

Mission of the Department:

- To provide quality education through blend of core and interdisciplinary courses with industry-institute interaction.
- To provide an environment conducive to develop and implement new ideas in engineering and technology.
- To practice and promote interpersonal and leadership skills to work with commitment for social responsibilities

Program Specific Objectives (PSOs)

- **PSO 1:** Able to apply fundamental knowledge of Electrical Engineering to identify, formulate and investigate real time problems of electrical sector and allied fields.

- **PSO 2:** Analyze, design and integrate Electrical systems using modern tools and techniques in electrical sector and create passion for life-long learning and research in advanced fields.

Program Outcomes (POs)

After completing the electrical engineering programme the students will be able to:

1. Apply knowledge of mathematics, basic science and engineering fundamentals to solve complex problems in electrical engineering.
2. Identify problem in electrical systems based on available data and interpret the results.
3. Design electrical systems that meet specified needs with safety considerations.
4. Design and conduct experiments, analyze and interpret data.
5. Use modern electrical engineering softwares and tools.
6. Create awareness of electrical engineering solutions for social benefit considering current and upcoming tools / technologies.
7. Understand the impact of engineering solutions in a global, economic, environmental context.
8. Demonstrate ethics and professional abilities.
9. Work effectively as an individual and as a member in a diverse team.
10. Communicate effectively in both written and verbal form.
11. Demonstrate knowledge and understanding of engineering and management principles for execution of projects.
12. Recognize the need and ability to learn technological changes.

Programme Educational Objectives (PEOs)

The B. Tech Electrical Engineering Programme is preparing the graduates:

PEO 1: To develop professional skills in students to provide solution to problems in electrical and allied fields.

PEO 2: To develop students with conducive learning attitude for lifelong learning.

PEO3: To demonstrate behavioral skills and ethics.

Annexure B

Program: B. Tech. (Electrical & Computer) Sem: I

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		Partial differentiation and complex numbers	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Electro-Chemistry	4	2	-	60	40	50	-	-	150	4	1	-	5
3		Electromagnetics and its applications	4	2	-	60	40	25	-	25	150	4	1	-	5
4		Solid State Devices & Electronic Circuits	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Computer Architecture & Data Structures with C	4	2	-	60	40	25	25	-	150	4	1	-	5
6		Electrical Workshop Practices	-	2	-	-	-	50	-	-	50	-	1	-	1
	Total		19	10	1	300	200	175	25	50	750	19	5	1	25

Program:B. Tech. (Electrical & Computer)Sem: II

Sr. No.	Course Code	NameofCourse	Teaching Scheme (Hrs./Week)			Examination Scheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Mathematicsforelectricalengineering	4	-	1	60	40	-	-	-	100	4	-	1	5
2		ModernPhysics	3	2	-	60	40	50	-	-	150	3	1	-	4
3		Instrumentation&Measurements	4	2	-	60	40	25	-	25	150	4	1	-	5
4		IndustrialSafetyPractices	4	2	-	60	40	25	25	-	150	4	1	-	5
5		ObjectorientedprogrammingwithC++	4	2	-	60	40	25	-	25	150	4	1	-	5
6		Simulation&Programming	-	2	-	-	-	25	-	25	50	-	1	-	1
	Total		19	10	1	300	200	150	25	75	750	19	5	1	25

Program:B.Tech.(Electrical&Computer)Sem:III

Sr. No.	Course Code	NameofCourse	Teaching Scheme (Hrs./Week)			ExaminationScheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		DC&ACMachines	3	2	1	60	40	25	-	25	150	3	1	1	5
2		PowersystemEngineering	4	2	-	60	40	25	-	-	125	4	1	-	5
3		DesignofElectricalInstallations	3	-	-	60	40	-	-	-	100	3	-	-	3
4		ComputationalAlgorithms	4	2	-	60	40	25	25	-	150	4	1	-	5
5		OperatingSystems*	4	2	-	60	40	25	25	-	150	4	1	-	5
6		ApplicationSoftwaresinElectricalEngineering	-	2	-	-	-	25	-	-	25	-	1	-	1
7		VocationalCourse-IAutoCADElectrical	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total		18	12	1	300	200	150	75	25	750	18	6	1	25
		SocialActivity-I**	-	-	-	-	-	-	-	-	-	-	-	-	2

*IndustryTaughtCourse–I
**Addon course

Program:B.Tech.(Electrical&Computer)Sem:IV

Sr. No.	Course Code	NameofCourse	Teaching Scheme (Hrs./Week)			ExaminationScheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Special Purpose Machines	4	2	-	60	40	25	25	-	150	4	1	-	5
2		Network & Synthesis	3	2	1	60	40	25	-	-	125	3	1	1	5
3		Power Electronics	4	2	-	60	40	25	-	25	150	4	1	-	5
4		Industrial Organization & Financial Management*	3	-	-	60	40	-	-	-	100	3	-	-	3
5		Data base management system(SQL)	4	2	-	60	40	25	-	-	125	4	1	-	5
6		IT Practices	-	2	-	-	-	25	25	-	50	-	1	-	1
7		Vocational Course-II Solar Power plant designing	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total		18	12	1	300	200	150	75	25	750	18	6	1	25
		MOOC-I**	-	-	-	-	-	-	-	-	-	-	-	-	2

*IndustryTaughtCourse– II
**Addon course

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology
Programme:B.Tech.(Electrical&Computer) –CBCS2021CoursewithAmendments

Program:B.Tech.(Electrical&Computer)Sem:V

Sr. No.	Course Code	NameofCourse	Teaching Scheme (Hrs./Week)			ExaminationScheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		AdvancedMicrocontroller&EmbeddedSystems	4	2	-	60	40	25	25	-	150	4	1	-	5
2		ElectricalMachineDesign&Analysis	3	-	1	60	40	-	-	-	100	3	-	1	4
3		IndustrialAutomation	4	2	-	60	40	25	25	-	150	4	1	-	5
4		IndustrialControlSystem-I	4	2	-	60	40	25	25	-	150	4	1	-	5
5		WebDesigning*	4	2	-	60	40	25	25	-	150	4	1	-	5
6		VocationalCourse-IIIElectricVehicleArchitecture& Modeling	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	19	10	1	300	200	125	125	-	750	19	5	1	25
		EnvironmentalStudies**	2	-	-	50	-	-	-	-	-	-	-	-	-
		SocialActivity-II***	-	-	-	-	-	-	-	-	-	-	-	-	2

*IndustryTaughtCourse– III
**Mandatoryauditcourse
***Addon course

Program:B.Tech.(Electrical&Computer)Sem: VI

Sr. No.	Course Code	NameofCourse	Teaching Scheme (Hrs./Week)			ExaminationScheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		ProtectionofPowerSystemComponents	4	2	-	60	40	25	25	-	150	4	1	-	5
2		IndustrialControlSystem-II	3	2	1	60	40	25	25	-	150	3	1	1	5
3		PowerSystem Modelingand Analysis	4	2	-	60	40	25	-	25	150	4	1	-	5
		QuantitativeTechniques,Communication&Values	4	-	-	60	40	-	-	-	100	4	-	-	4
4		IlluminationEngineering*	4	2	-	60	40	25	25	-	150	4	1	-	5
5		VocationalCourse-IVMaintenanceofLTSwitchgear	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	19	10	1	300	200	125	100	25	750	19	5	1	25
		MOOC-II**	-	-	-	-	-	-	-	-	-	-	-	-	2

*IndustryTaughtCourse–IV
**Addon course

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology
Programme:B.Tech.(Electrical&Computer) –CBCS2021CoursewithAmendments

Program:B.Tech.(Electrical&Computer)Sem: VII

Sr. No.	Course Code	NameofCourse	Teaching Scheme (Hrs./Week)			ExaminationScheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		PowerSystemStability&Control	3	2	1	60	40	25	25	-	150	3	1	1	5
2		IndustrialDrives&Applications*	4	2	-	60	40	25	-	25	150	4	1	-	5
3		PowerQualityIssues&MitigationTechniques	4	2	-	60	40	25	25	-	150	4	1	-	5
4		Elective-I	3	-	-	60	40	-	-	-	100	3	-	-	3
5		EnergyAudit	-	2	-	-	-	25	25	-	50	-	1	-	1
6		ProjectStage-I	-	2	-	-	-	50	50	-	100	-	3	-	3
7		Internship#	-	-	-	-	-	25	25	-	50	-	3	-	3
	Total		14	10	1	240	160	175	150	25	750	14	10	1	25

*IndustryTaughtCourse–V #
Period- 60 days

Program:B.Tech.(Electrical&Computer)Sem:VIII

Sr. No.	Course Code	NameofCourse	Teaching Scheme (Hrs./Week)			ExaminationScheme(Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		HighVoltagepowergenerationandmeasurement	3	2	-	60	40	25	25	-	150	3	1	-	4
2		ComputerAidedPowerSystemanalysis	3	2	1	60	40	25	25	-	150	3	1	1	5
3		ComputerNetworks*	4	2	-	60	40	25	25	-	150	4	1	-	5
4		Elective-II	3	2	-	60	40	25	25	-	150	3	1	-	4
5		ElectricalCodes&Standards	-	2	-	-	-	25	25	-	50	-	1	-	1
6		ProjectStage-II	-	4	-	-	-	50	50	-	100	-	6	-	6
	Total		13	14	1	240	160	175	175	-	750	13	11	1	25
		ResearchPaperPublication**	-	-	-	-	-	-	-	-	-	-	-	-	2

*IndustryTaughtCourse– VI
**Addon course

ListofElectiveCourses:

Elective-I		Elective-II	
DigitalSignalProcessing	HVDC	AdvancedJava	PHP
Testing&CommissioningofElectrical	EnergyStorageSystems	.Net	PERL
UtilizationofElectricalEnergy	PowerSystemPlanningand	AI	Python
Robotics	RenewableEnergySystems	Industry4.0	ANN
SmartGrid			

BharatiVidyapeethDeemedtobeUniversity,Pune
Faculty of Engineering & Technology
Programme:B.Tech(ElectricalEngineering)Sem–I(2021Course)

PartialDifferentiationandComplexNumbers

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:-03
Tutorial:01Hours/Week	ContinuousAssessment:40Marks	Tutorial:-01
		Total:- 04

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

BasicsofComplexnumber,derivativesandintegration.

CourseObjectives:

To study

- Ordinaryandpartialdifferentiation.
- Vectorcalculusanditsapplications.
- Complexdifferentiationandintegration.

CourseOutcomes: Studentswillbeableto

1.	Understandmethodsoffindingnthderivativeoffunctions.
2.	Understandmethodsoffindingpartialderivatives.
3.	Understandthemethodoflocatingstationarypointsandvalue.
4	Understandline,surfaceandvolumeintegral.
5	Understandtheanalyticfunctions.
6	Understandmethodsofevaluatingcontourintegration

UNIT-I	**DifferentialCalculusandExpansionOfFunctions:**	**(06Hours)**
	SuccessiveDifferentiation,nthDerivativesofStandardFunctions,Leibnitz'sTheorem,Taylor'sSeries and Maclaurin's Series.	
UNIT- II	**PartialDifferentiationAndApplications:**	**(06Hours)**
	PartialDerivatives,Euler'sTheoremonHomogeneousFunctions,Implicitfunctions,TotalDerivatives, Change of Independent Variables. Errors and Approximations.	
UNIT-III	**JacobianandMaximaAndMinima:**	**(06Hours)**
	Jacobiansandtheirapplications,ChainRule,FunctionalDependence.MaximaandMinimaofFunctions of two variables, Lagrange's method of undetermined multipliers.	
UNIT-IV	**VectorIntegralCalculusandApplications:**	**(06Hours)**
	Line,SurfaceandVolumeintegrals,Work-done,Green'sLemma,Gauss'sDivergencetheorem,Stoke's theorem.ApplicationstoproblemsinFluidMechanics,Continuityequations,Streamlines,Equationsof motion, Bernoulli's equation.	
UNIT-V	**ComplexVariables:**	**(06Hours)**
	Function f(z) of complex variable, limit, continuity and differentiability of f(z),Analytic function, necessaryandsufficientconditionsforf(z)tobeanalytic(withoutproof),Cauchy-Riemannequationsin Cartesian coordinates(withoutproof)Milne-Thomson method to determineanalyticfunction f(z) when realpart(u)orImaginarypart(v)oritscombination(u+voru-v)isgiven,Harmonicfunction, Harmonicconjugateandorthogonaltrajectories.	
UNIT- VI	**ComplexIntegration:**	**(06Hours)**
	LineIntegral,Cauchy'sIntegraltheoremforsimpleconnectedand multiplyconnectedregions(without proof), Cauchy's Integral formula (without proof).Taylor's and Laurent's series (without proof). Definition of Singularity, Zeroes, polesof f (z), Residues, Cauchy's Residue Theorem (withoutproof).	

Projectbasedlearning:

1. Finiteorderdifferentiationofstandardfunctions
2. Leibnitztheorem
3. ErrorsandApproximation
4. Totalderivative
5. Implicitfunctions
6. Maximaandminimaforfunctionoftwovariables
7. LangragemethodofUndeterminedmultipliers

8. ContinuityEquation
9. Bernaulli'sEquation
10. Harmonicfunction
11. Singularities
12. CauchyResidueTheorem
13. Taylor'sandLaurent'sseries
14. Green'slemma
15. Gaussdivergencetheorem
16. Stokestheorem
17. OrthogonalTrajectories
18. Analyticfunctions

TextBooks:

1. P.N.WartikarandJ.N.Wartikar,AppliedMathematics(VolumesIandII),7thEd.,PuneVidyarthiGrihaPrakashan,Pune,2013
2. B.S.Grewal,HigherEngineeringMathematics,42ndEd.,KhannaPublication,Delhi
3. B.V.Ramana,HigherEngineeringMathematics,6thEd.,TataMcGraw-Hill,NewDelhi,2008.

ReferenceBooks:

1. ErwinKreyszig,AdvancedEngineeringMathematics,10thEd.,JohnWiley&Sons,Inc.,2015.
2. PeterV.O'NeilAdvancedEngineeringMathematics,7thEd.,CengageLearning,2012.
3. MichaelGreenbergAdvancedEngineeringMathematics,2ndEd.,PearsonEducation,1998.

SyllabusforUnitTest:

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

Electro-Chemistry

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:-04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:- 01
	TermWork:50Marks	Total:- 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

BasicunderstandingofChemistry,Electrochemicalseries,Electrodepotential,Primaryandsecondarycells. Definition of corrosion, Terms related Nano-science.

CourseObjectives:

- Todeveloptheinterestamongthestudentsregardingchemistryandtheirapplicationsinengineering.
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
- Thestudentshouldunderstandtheconceptsofchemistrytolaythegroundworkforsubsequentstudiesinthefieldsuch asElectricalEngineering.

CourseOutcomes: Studentswillbeableto

1.	Understandtheconceptofthebatterywithitsapplications.
2.	UnderstanddifferenttypesofHydrogenstoragesystemsforvariousengineeringapplications.
3.	Understandandapplytheknowledgeof Processesofnanotechnology.
4	Applytheknowledgeofindustrialchemicalprocesstostudyprocessinstrumentationwithsafety.
5	Understandtypesofcorrosioncontrolmeasuresforvariousengineeringapplications.
6	UnderstandimportanceofGreenChemistryforClean Technology.

UNIT-I	**BatteryanditsTypes:**	**(08Hours)**
	Introduction, Batteries and BatteryTechnology- characteristics,specifications and applications, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Lead acid battery, Coin CellBatteries,Ni-Cd Batteries,Ni-MHBatteries,Li-IonBatteries,Li-PoBatteries.BasicMaintenance of Batteries.	
UNIT- II	**EnergyStorageSystems:**	**(08Hours)**
	Introduction, Fuel cell, Types and Examples of Fuel Cells, Applications and limitations of Fuel Cells, Flywheel energy storage system. Hydrogen storagewith typesand reactions:- Physical storage- Metal Hydride and Carbon nano-fibers; Chemical storage :- Sodium boro-hydride and Alkali metal hydrides.	
UNIT-III	**Nano-ScienceandTechnology:**	**(08Hours)**
	Introduction, Nanotechnology applications -Energy sector:- Nano-batteries, Wind power generations – nano-generators, Solar paints or photovoltaic paints – can replace solar panels and Electronic sector:- Nano-RAMetc. Material self assembly, Molecular Vs material self assembly, Self assembling materials,Two dimension assemblies, Meso-scale self assembly (MESA), Coercing colloids, Processes of nanotechnology, Processes used in bottom up approach [sol-gel processing, chemical vapor deposition (CVD),plasmaorflamespraying synthesis,laserpyrolysis]Nano-material,Nano-crystals,/Nano-particles,Nanostructure.	
UNIT-IV	**IndustrialChemicalProcess:**	**(08Hours)**
	Introduction, classification of chemical industries, material of construction and selection of materials, process instrumentation, safety, fire protection and waste disposal, Electro-thermal industries: Introduction, classification and advantages of electric furnace.	
UNIT-V	**ProtectiveCoatings:**	**(08Hours)**
	Introduction, Metallic coatings, Hot dipping :- Galvanising and Tinning Anodizing, Electroplating. Methods of cleaning articles before electro-deposition, Electroplating methods, Electro-less plating. Some other metallic coatings, applications of protective coatings in electrical industry, Chemical conversion coatings, Organic Coatings, Paints, Varnishes, Enamels, Special paints.	
UNIT- VI	**GreenChemistryforCleanTechnology:**	**(08Hours)**
	Introduction, Twelve Principles of Green chemistry, Efficiency parameters of reactions, numerical on atom economy, Synthesis by using Traditional and Green pathway for Adipic acid and Indigo,	

	Disadvantages and Advantages related to synthesis method, Green solvents (Ionic liquid supercritical CO_2) and products from natural materials.	

TermWork:

Thetermworkshallconsistofrecordofalleightexperimentsfrombelowlist.

1. VariationofcellpotentialinZn/Zn2+||Cu2+/Cuwithchangeinconcentrationofelectrolytes(CuSO4orZnSO4)atroom temperature.
2. SettingofaGalvanicCellanddeterminationofcellvoltage.
3. SynthesisofNi-SiO2nano-compositesbySol-Geltechnique.
4. Toobtainmetalliccoatingonbasemetalbyusingthe methods,ElectroplatingandElectro-lessplating.
5. Determinationofrateofcorrosionofaluminiuminacidicandbasicmedium.
6. PreparationofGrignardReagentwithAGreenerAlternative.
7. Tocoatcopperandzinconironplateusing electroplating.
8. Colloidalsynthesisof2-6or3-5semiconductorquantumdotsnano-particles.

Projectbasedlearning: Studentshavetocompleteanysixassignmentsfromthelistgivenbelow:

1. AssignmentonAcidandAlkalineStorageBattery,DryCellandLeadacidbattery.
2. AssignmentonHydrogenstoragewithtypesandreactions.
3. AssignmentonProcessesusedinbottomupapproach.
4. Assignmentonmaterialofconstructionandselectionofmaterialsin Industrialchemicalprocess.
5. AssignmentonCoinCellBatteries,Ni-CdBatteriesandNi-MHBatteries.
6. AssignmentonMolecularVsmaterialselfassembly.
7. AssignmentonOrganicCoatings,Paints,Varnishes,Enamels,Specialpaintsforcorrosionprevention.
8. AssignmentontypesofHotdipping:-GalvanisingandTining.
9. AssignmentonGreensolventsandproductsfromnaturalmaterials.
10. AssignmentonSynthesisbyusingTraditionalandGreenpathwayforAdipicacidandIndigo.

TextBooks:

1. EngineeringChemistry,DhanpatRai&Sons,Delhi,1992.JainP.C&JainMonica
2. IntroductiontoNanotechnology,C.P.PooleJr.,F.J.Owens,WileyInterscience,2003
3. NanotechnologyScience,InnovationandOpportunity,L.E.Foster,PearsonEducation,2007
4. EngineeringChemistry-Fundamentalsandapplications,CambridgePublishers-2015.ShikhaAgarwal
5. ATextBookofEngineeringChemistry,ShashiChawla,DhanpatRai&Co,2004

ReferenceBooks:

1. EngineeringChemistry(16thEdition)Jain,Jain,DhanpatRaiPublishingCompany,2013
2. AustinG.T,Shreve's"ChemicalProcessIndustries",5thed.,McGrawHill[1984]
3. FaithW.L.,K.,KeyesD.B.andClarkR.L.,"IndustrialChemicals"JohnWiley[1975]
4. EnvironmentalChemistry–A.K.De,5thEdition(Newageinternationalpublishers)
5. EnvironmentalChemistrywith GreenChemistryA.KDas,BooksandAllied(P)Ltd

SyllabusforUnitTest:

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

ElectromagneticsAndItsApplications

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory: 04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25MarksPractical:25Marks	Total:05

CoursePre-requisites:

1. Studentsshouldhavebasicknowledgeofphysicsi.e.electricalenergyandpower,magnetism,electrostatics,magnetic materials, magnetic fields, electromagnetic theory etc.
2. Studentsshouldhavebasicknowledgeofmathematicsi.e.trigonometricfunctions,matrices,complexnumbers, differentiation and integration, vectors etc.

Courseobjectives:

TointroducefundamentalconceptsofDCCircuitAnalysisandNetworkTheorems,MagneticcircuitandElectromagneticInduction, AC Fundamentals & Single-Phase AC Circuits, Three Phase AC Circuits, Transformer, Performance and testing of transformer.

CourseOutcomes:

Thestudentswillbeableto

1.	EvaluateD.C.circuitsusingnetworktheorems.
2.	Understandtheoryofelectromagneticinduction.
3.	Describeandestimatesingle-phaseA.C.circuits.
4.	Analyzeandevaluatethree-phaseA.C.circuits.
5.	Illustrateconstructionalfeaturesanddescribedifferentparametersoftransformer.
6	Identifyandanalyzeperformanceoftransformer.

Topicscovered

UNIT-I	**DCCircuitAnalysisandNetworkTheorems:** CircuitConcepts:Conceptsofnetwork,Activeandpassiveelements,voltageandcurrentsources, concept of linearity and linear network, unilateral and bilateral elements,KCL and KVL, Super nodeandSupermeshanalysis,Networkreductionusingseries-parallelandstar-delta transformation,Thevenin'stheorem,Norton'stheorem,Superposition theorem,Maximumpower transfer theorem. (Simple numerical problems).	**(08 Hours)**
UNIT- II	**MagneticcircuitandElectromagneticInduction** **MagneticCircuit:**flux,fluxdensity,fieldstrength,analogybetweenelectric&magneticcircuits, Right hand thumb rule, magnetic leakage, B-H curve, Magnetic hysteresis, hysteresis and eddy currentlosses,magneticcircuitcalculations,mutualcoupling,Seriesandparallelmagneticcircuit and simple numericals. **Electromagnetic Induction:** Faraday's Law of EMI, Statically and dynamically induced emf, Lenz's Law, Self-Inductance, Coefficient of Self-inductance (L), Mutual inductance, Coefficient ofMutualinductance(M),Signanddotconvention,self-inducedEMFandmutuallyinducedEMF, CoefficientofCoupling,Inductance,EnergyStoredinMagneticField.(Simplenumerical problems).	**(08 Hours)**
UNIT-III	**ACFundamentals&Single-PhaseACCircuits:** AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage andcurrent.Analysisofseries,parallelandseries-parallelRLCCircuits:apparent,active& reactivepowers, power factor,causes and problems of low powerfactor, power factor improvement; resonance in series and parallel circuits, (simple numerical problems).	**(08 Hours)**
UNIT-IV	**ThreePhaseACCircuits:** Threephasesystem-itsnecessityandadvantages,meaningofphasesequence,staranddelta connections,balancedsupplyandbalancedload,lineandphasevoltage/currentrelations,3-ph balancedACCircuits,three-phasepowerandItsmeasurement(simplenumericalproblems).	**(08 Hours)**
UNIT-V	**Transformer:** Single phase transformer: construction, principle of operation,equivalent circuit, phasor diagram,EMF equation,voltage ratio, current ratio, kVA rating, losses in transformer,Concept of ideal transformer. Threephasetransformers:Introduction,Threephasetransformerconnections, Auto-transformer. Welding transformer.	**(08 Hours)**
UNIT-VI	**Performanceandtestingoftransformer**	**(08 Hours)**

	Transformeronnoload,Transformeronload,Efficiencyoftransformer,Conditionformaximum efficiency, All-day efficiency, Parallel operation of single-phase transformers, Parallel operation of three-phase transformers. (simple numerical problems). Transformers tests:Open circuit or No-load test, Separation of core losses,Short circuit or impedance test, Regulation of transformer, Sumpner or Back-to-back test. Determination of Efficiency & Regulation by direct load test.	

ListofPractical'stobeperformedinthelaboratory:	
1.	PlottingB-Hcharacteristicsforamaterial.
2.	VerificationofKirchhoff'sLaws.
3.	VerificationofSuperpositionTheorem.
4.	VerificationofThevenin'sTheorem.
5.	VerificationofMaximumPowerTransferTheorem.
6.	IdentifyperformanceofR-Lseries,R-Cseries,R-L-Cseriescircuit.
7.	IdentifyperformanceR-L-Cparallelcircuit.
8.	Verificationofvoltageandcurrentrelationshipsinstaranddeltaconnected3-phasenetworks.
9.	OpencircuitorNo-loadtestontransformer.
10.	Directloadingtestonsinglephasetransformer.
11.	SumpnerorBack-to-backtestontransformer.
12.	DeterminationofEfficiency&Regulationbydirectloadtest.
Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	
Projectbasedlearning: Studentshalldemonstrateminimumoneconceptbasedonsyllabustopic.	
1. Demonstrationofprincipleofelectromagnetism&it'sapplications.	
2. Studyandunderstandpracticalspecificationsoftransformer.	
3. Demonstrationofphenomenonofelectromagneticinduction.	
4. Demonstrationofelectromagnetismanditsapplicationsbyusingprofessionalsoftwaretool.	
5. Homeautomationsystemusing IoT	
6. SmartEnergymeterusingGSM	
7. SolarandSmartenergysystems	
8. AutomaticSolarTracker	
9. PCBManufacturing	
10.SmartCallingBell	
11.WirelessPower transmission	
12.GasLeakageDetector	
13.Firedetectionsystem10.SmartTrafficLightingSystem	
14.HomeautomationsystemusingIoT	
Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	
ReferenceBooks:	
1.	ElectricalTechnology-EdwardHuges(Pearson)
2.	BasicElectricalEngineering-D.P.Kothari,JNagarath(TMC)
3.	Electricalpowersystemtechnology-S.W.Fordo,D.R.Patric(PrenticeHall)
4.	PrinciplesofElectronics-Dr.H.M.Rai(SatyaPrakashan)
5.	ElectronicDevicesandCircuitTheory-R.L.BoylestadandL.Nashelsky(PHI)
6.	Electrical,ElectronicsMeasurementsandInstruments-(SatyaPrakashan)
7.	PrinciplesofCommunicationEngineering-AnokhSingh,A.K.Chhabra(SChand)
8.	ATextbookofElectricalTechnologyVolume-I,-B.L.Theraja.S.ChandandCompanyLtd.,NewDelhi
9.	ATextbookofElectricalTechnologyVolume-II,-B.L.Theraja.S.ChandandCompanyLtd.,NewDelhi
10.	BasicElectricalEngineering-V.K.Mehta,RohitMehta,S.ChandandCompanyPvtLtd.,NewDelhi
11.	ElectromagneticsandApplications-DavidH.Staelin,DepartmentofElectricalEngineeringandComputerScience Massachusetts Institute of Technology Cambridge, MA(2011)
UnitTest:	
UnitTest-1	UNIT– I,UNIT–II,UNIT- III
UnitTest-2	UNIT– IV,UNIT–V,UNIT-VI

SolidStateDevices&ElectronicCircuits		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04 Hours/Week	EndSemesterExamination:60Marks	Theory: 04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Practical:25 Marks	Total:05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	FundamentalsofElectricalEngineering
2.	Fundamentalsofsemiconductorphysics.

CourseObjectives:

1. Tostudydifferentsolidstateelectronicsdevicesandvariouselectronicsystemsusingthesedevicesand understand the principle of electronic circuits.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Explainingthebasicsemiconductordevices.
2	Illustrateactiveandpassivefilters.
3	Explainingaboutamplifiesandoscillators
4	Outliningoperationalamplifiers
5	Applyamplifiersforcreatinggeneralizedlinearapplications.
6	IllustratingspecializedICapplications.

UNIT– I	**ReviewofsemiconductorDevices**	**(08 Hours)**
	Rectifier diode Zener diode, Tunnel diode, Schottky diode, LED, PIN diode, photodiode, SCR, TRIAC their symbol, construction, principle of operation characteristics, specifications, mathematicalequationsandapplications.BJT-CE,CB,CCconfigurations,BJTbiasing,FET-biasing, MOSFET biasing, Difference between BJT and FET , Basics of NMOS,PMOS, CMOS. Concept of Device modeling. World wide main manufacturers of various solid state devices.	
UNIT-II	**Active&Passivefilters**	**(08 Hours)**
	WorkingofC,L,PIfilters,Typesoffilters:lowpassfilter,highpassfilter,bandpassfilter,band stop filter, band reject filter, all pass filter. Difference between active and passive filters. Advantages and applications of active and passive filters. Voltage regulators, types and working principle,BlockdiagramofRegulatedDCpowersupply-Types-OperationofZenerdiodevoltage regulator,Transistorseriesvoltageregulator, Comparisonofseriesandshuntvoltageregulator,use of negative feedback, block diagram and working of SMPS.	
UNIT-III	**Amplifiersandoscillators**	**(08 Hours)**
	Frequency response of BJT and MOSFET amplifier. Single stage Transistor amplifier-load line analysis, voltage gain, classification of amplifiers, amplifier equivalent circuit. Multi-stage Transistor Amplifier-RC coupled transistor amplifier, Transformer and direct coupled amplifiers, comparison of different types of coupling. Transistor audio power amplifiers, difference between voltageandpoweramplifier,classificationofpoweramplifier.Amplifierswithnegativefeedback. SinusoidalOscillators-LCtankcircuit,variousoftypesandcircuitsofOscillatorssuchas,Hartely oscillator. Phase shift oscillator-Wien bridge oscillator.	
UNIT-IV	**OperationalAmplifier**	**(08 Hours)**
	Concept of virtual short, The ideal Op-amp, equivalent circuit of Op-amp, ideal voltage transfercurve,openloopOp-ampamplifierconfigurations-Thedifferentialamplifier,Theinvertingamplifier,Thenon-invertingamplifier.OP-ampparameters,Blockdiagramrepresentationof feedbackconfigurations-voltageseriesfeedbackamplifier,voltageshuntfeedbackamplifier,differential amplifiers, Frequency response, high frequency Op-amp, Op-amp as adder and substractor. Various Op-amp ICs and their manufacturers.	
UNIT-V	**GeneralLinearApplications**	**(08 Hours)**

	DCandACamplifiers,ACamplifierwithsinglesupplyvoltage,Thepeakingamplifier,Summing, Scaling and averaging amplifiers, Inverting configuration, Non-inverting configuration, Differential configuration, instrumentation amplifiers, logarithmic amplifier, voltage to current converter, current to voltage converter, the integrator, the differentiator, comparators and oscillators. Schmitt trigger circuit, Electrical applications of linear circuits Concept of amplifier againststepuptransformerinelectricalengineering.,Roleofsolidstatedevicesinelectrical engineering.	
UNIT-VI	**SpecializedICapplication**	**(08 Hours)**
	The 555 timer as monostable, astable multivibrartor, applications of monostable and astable multivibrator phase locked loops operating principle , 565 PLL applications, Power amplifiers – poweramplifiersusingpowerbusters,monolithicpoweramplifier,voltageregulators–fixed, adjustable, switching and special voltage regulator and commonly ICs used in each type. Various manufacturers and cost of commonly used regulators and timer ICs.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

1. StudyofJFETdrainandtransfercharacteristics.
2. JFETbiasingarrangementGraphicalmethod
3. BuildandTestJFETCSamplifier.
4. FindperformanceparametersforJFETamplifier-A_V,R_i,R_O
5. SimulationofJFETCSamplifierusingmultisim/spice.
6. FindperformanceparametersforJFETamplifier-A_V,R_i,$R_O$andcomparewiththeoreticalandpracticalresults.
7. InputandOutputCharacteristicsofBJTCEconfiguration.Findh-parametersfromcharacteristics.
8. BuildandTestBJTinCEamplifierandfindperformanceparameters-A_V,R_i,R_O,A_I
9. SimulationofBJTCEamplifierusingmultisim/spice
10. StudyofMOSFETdrainandtransfercharacteristics
11. VoltagefollowerbyOp-amp.
12. InvertingamplifierbyOp-amp.
13. Non-invertingamplifierbyOp-amp.
14. SummingamplifierbyOp-amp.
15. DifferenceamplifierbyOp-amp.
16. StudyofanyfiveICsstudiedinthesubject –relevantdiagrams,costing,variousconfigurations,manufacturers,main specifications and introduction of their data sheet.
17. Selfarrangedindustrialvisittoanyelectronicsindustryandreportwritingonsame.
18. Attendingseminarsession/IEEEconferencesession/localconferencesession/webinar/talksbyanyelectronicsrelated expert and writing report on same

ProjectBasedLearning:

1. SimpleLEDblinkingblock.
2. Simulationoflogicgates.
3. Studyofautomaticlightcontrol.
4. Designofhalfwaverectifier(simulationorhardware).
5. Regulatedpower supply.
6. Circuitdesigning,simulationandelectricalparametermeasurement.
7. Applicationoftransistorasaswitch.
8. StudyofJFETcharacteristicsusingsoftwaresimulation.
9. ApplicationofMOSFETasswitch.
10. ApplicationofOp-ampasnon-invertingamplifier
11. Designofinvertingamplifier.
12. Designofnon-invertingamplifier.
13. DesignofOp-ampasadder.
14. DesignofOp-ampassubtractor.
15. DesignofOp-ampasdifference amplifier.

TextBooks:

1. Neamen-SemiconductorPhysicsandDevicesTMH
2. Bhattacharya&Sharma-SolidStateElectronicDevices-Oxford
3. Maini&Agrawal-ElectronicsDevicesandCircuits-Wiley
4. PrinciplesofElectronics-V.K.Mehta.S.Chand&CompanyLimited.

5. OP-Amps&LinearIntegratedCircuts-RamakantA.Gayakwad 6. OpearationalamplifiersbyD.Roychaudhari	
ReferenceBooks:	
1. Milman,Halkias&Jit-ElectronicsDevicesandCircuits-TMH	
2. Bell-ElectronicsDevicesandCircuits-Oxford	
3. Singh&Singh-ElectronicsDevicesandIntegratedCircuits–PHI	
4. Bogart,Bisley&Rice-ElectronicsDevicesandCircuits-Pearson	
5. Kasap-PrinciplesofElectronicMaterialsandDevices-TMH	
6. Boylestad&Nashelsky-ElectronicsDevicesandCircuitTheory-Pearson	
7. Salivahanan,Kumar&Vallavaraj-ElectronicsDevicesandCircuits-TMH	
UnitTests:	
UnitTest-1	UNIT–I,UNIT–II,UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

ComputerArchitecture&DataStructureswithC		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04 Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Oral:25 Marks	Total:05

CoursePre-requisites:	
TheStudentsshouldhaveknowledgeof	
	ComputerSystem,ApplicationsofComputersandComputeroperations.
CourseObjectives:	
	Tolearnthebasicstructureandoperationsofacomputer. UnderstandandmemoryandI/Oorganizationofatypicalcomputersystem. Understand the basics and applications of Data Structure.

CourseOutcomes:	**Afterlearningthiscoursestudentswillbeableto**
1	ExplainthebasicstructureofComputersystemanditsoperation
2	IllustrationofComputerProcessorandControlUnit
3	IdentifyParallelismandMemoryOrganization
4	IdentifythebasicsofCProgramming
5	DiscussstheconceptofDataStructures
6	StudyofLinearandNonLinearDataStructure

UNIT–I	**BasicStructureofComputerSystem**	**(08Hours)**
	Computational model, Evolution of computer architecture, Functional Units- Basic Operational Concepts, Performance, Instructions: Language of the Computer,Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.	
UNIT- II	**ProcessorandControlUnit**	**(08Hours)**
	A Basic MIPS implementation - Building a Datapath - Control Implementation Scheme - Pipelining - Pipelined datapath and control - Handling Data Hazards & Control Hazards - Exceptions.	
UNIT-III	**ParallelismandMemoryOrganization**	**(08Hours)**
	Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors. Memory Hierarchy - memory technologies - cache memory - measuring and improving cache performance - virtual memory, TLB’s - Accessing I/O Devices - Interrupts - Direct Memory Access - Bus structure - Bus operation - Arbitration - Interface circuits - USB.	
UNIT-IV	**CProgrammingbasics**	**(08Hours)**
	Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensionalandTwo-dimensionalarrays.Strings-Stringoperations–StringArrays.Simple programs-sorting-searching–matrixoperations.	
UNIT-V	**Functions,Pointers,StructuresAndUnions**	**(08Hours)**
	Functions–Passbyvalue–Passbyreference–Recursion–Pointers–Definition–Initialization – Pointersarithmetic.Structuresandunions–definition–Structurewithinastructure–Union– Programs using structures and Unions – Storage classes, Pre-processor directives.	
UNIT-VI	**LinearandNonLinearDataStructure**	**(08Hours)**
	Arrays and its representations – Stacks and Queues – Linked lists – Linked list-based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomialaddition.Trees–BinaryTrees–Binarytreerepresentationandtraversals–Binary SearchTrees–Applicationsoftrees.Setrepresentations–Union-Findoperations.Graphandits representations – Graph Traversals.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

1. Studyofperipherals,componentsofaComputerSystem
2. StudyofBinaryandDecimalInter-Conversionsystem.
3. StudyofBinaryAddition
4. StudyofBinarySubtraction.
5. StudyBooth'sMultiplicationalgorithm
6. StudyofRestoringDivision
7. StudyofNonRestoringDivisionAlgorithm
8. StudyofLogisimTool.
9. Realizationofthebasiclogicanduniversalgates
10. Designofhalf-addercircuitusingbasicgates
11. Designoffull-addercircuitusingbasicgates.
12. Programtocreate&manipulatedatabaseusingstructure
13. Programtoaddtwopolynomialusingarrayofstructure.
14. ProgramtoimplementprimitiveoperationonSequentialfile.
15. Programtosearchforrecordfromagivenlistofrecordsstoredinarrayusingi)Linearsearchii)Binarysearch
16. Programtosortanarrayofnamesusingi)Bubblesortii)Insertionsortiii)Quicksort

Projectbasedlearning:

1) DevelopmentofPhoneBookApplicationinC
2) DevelopmentofTemperatureConversion Table
3) StudyofMotherBoardcomponents.
4) C-Programmingexperiments
5) WriteaCprogramtoadd,subtractmultiplyand dividetwonon-zeronumbers.
6) WriteaCprogramtoprintalloddnumbersfrom1to100usingforloopandevennumbersusingwhile loop.
7) WriteaCprogramtocreateamenuofmathoperationsusingswitchcaseanddo-whileloop.Theprogramshouldinput1-2 numbers and give options like square, cube, exponent (x^y or y^x), multiply , divide . ensure non zero numbers.
8) WriteaCprogramtocopyallnumbersinanarraytoanotherarrayinreverseorderanddisplaytheresult.
9) WriteaCprogramtofindthefactorialofagivennumberusingrecursivefunction.
10) WriteaCprogramtoreversethestring(inthesamespace)andprinttheresultantstring.Makeuseofpointers.
11) Projectwork(Options):
12) Phonebookapplication(Nonpersistent)
13) Temperatureconversiontable(-50Cto 150C)
14) Customerbillingsystem.
15) Bus/Airplaneseatreservationsystem.

TextBooks:

1. DavidA.PattersonandJohnL.Hennessy,"ComputerOrganizationandDesign:TheHardware/SoftwareInterface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.
2. PradipDeyandManasGhosh,—ProgramminginC,SecondEdition,OxfordUniversityPress,2011.
3. EllisHorowitz,SartajSahni,SusanAnderson-Freed,—FundamentalsofDataStructuresinC,SecondEdition,University Press, 2008.

ReferenceBooks:

1. CarlHamacher,ZvonkoVranesic,SafwatZakyandNaraigManjikian,"ComputerOrganizationandEmbeddedSystems", Sixth Edition, Tata McGraw Hill, 2012.
2. WilliamStallings,"ComputerOrganizationandArchitecture–DesigningforPerformance",SixthEdition,Pearson Education, 2003.
3. JohnP.Hayes,"ComputerArchitectureandOrganization",ThirdEdition,TataMcGrawHill,1998.
4. JohnL.HennesseyandDavidA.Patterson,"ComputerArchitecture –AQuantitativeApproach",MorganKaufmann/ Elsevier Publishers, Fifth Edition, 2012.
5. MarkAllenWeiss,—DataStructuresandAlgorithmAnalysisinC,SecondEdition,PearsonEducation,1996

UnitTests:

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

ElectricalWorkshopPractices		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:-NA	EndSemesterExamination:-NA	NA
Practical:02Hours/Week	ContinuousAssessment:-	Practical:01
	TermWork:50Marks	Total: 01

CoursePre-requisites:	
TheStudentsshouldhaveknowledgeof	
1.	Basicconceptsofelectricalengineering.
CourseObjectives:	
	1. Tomakethestudentsfamiliarwithconstruction,workingandmaintenanceofelectricalappliancesindailyuse 2. Topreparestudentsforworkingondifferenthardwareprojectsbydevelopinghardwareskills.
CourseOutcomes: Aftersuccessfulcompletionofthiscourse,studentwillbeableto	
1.	Understandtheuseofelectricalsafetydevices
2.	Understandtheworkingofelectricaltoolsandtheirapplications
3.	Understandvariouselectricalaccessoriesandtheir applications
4	Undertsandvarioustypesofwiringandluminaries.
5	Undertsandoverhaulingofamotor/generator
6	Undertsandelectricvehicle,variousmotorsandbatteries
Instructions:	
	• Termworkshallconsistofreportsforminimumfiveexercises. • Theexercisemustbecarriedoutinagroupofmaximum4students. • Studentsshouldwritetheprocedure,observationsandconclusionintheformofreportwhichwillbe evaluated for term work.
Content	
I	**ElectricalSafetyDevicesandmethodsawareness** Various safety devices for protection of electrical installation, earthing rods, megger, insulation tester, etc. Various safety devicesusedfor firstaidand electricfirehazards. Artificial respiration.Electrical safetydevicesfor working onoverheadlines,inspectionofoverheadlineswithdrones,thermalcameraOperationofsafetyequipment, Operation of fire equipment, high voltage maintenanceuniform, maintenance with drones and helicopters
II	**StudyofElectricaltools** Acquaintance of various toolsfor wiring such aswire stripper, bearing puller, hand drilling machine, pliers etc. and variouselectricalmeasuringinstrumentssuchasdigitalandanalogue multi-meter,ammeters,voltmeters,wattmeter, frequency meters, phase sequence meters, tong tester, etc. Studyofvarioustoolsforwiringsuchaswirestripper,bearingpuller,handdrillingmachine,pliers etc Study of various electrical measuring equipment such as digital and analogue multi-meter, ammeters, voltmeters, wattmeter, frequency meters,phase sequence meters, tong tester, megger, test lamp, insulation tester, earthing rods, thermal camera etc. Breadboardassemblyandgeneral-purposePCBsolderingandde-soldering Dismantling and assembly of switchgears in simple electrical installations. Development of hardware kit for DC circuit and network theorems. Developmentofcombined±12V,±5Vregulatedpowersupply.Developmentofmobilecharger Development of extension board Cablejointingandterminationkit
III	**Electricalaccessories** Solderingkit.selectricalpowersupplyingequipments),Wiringofdistributionbox.contactors,withwiring. distribution box with MCB, ELCB, RCCB and MCCB. Assembly of star delta starter, autotransformer starter, DOL and3pointstarterwithNVCconnectionsandoverloadoperation.Energymeter,Softstartersswitches,varioussensors temperature sensors, pressure sensors, speed sensors, moisture sensors, humidity sensors, various types ofanemometers, solar panel concept of electrical supply ac supply, dc supply, three phase ac supply, electricity bill **Electrical components and materials** Typesofcables,Cablejointing andterminationkit,wires,lightsources,resistors, capacitors, inductors. transformer, variac, d.c.power supply, insulators, insulating and conducting materials, Gang operated device

IV	**Wiringandluminaries** Batten wiring, plastic casing and capping wiring, wooden casing and capping wiring, cleat wiring, conduit wiring, concealed conduit wiring, Wiringof40Wfluorescentlamp Halogenlamp,sodiumvaporlamp,LEDlamp,MetalHalidelamps,mercury lamp
V	**Overhaulingofamotor/generator(handsonexperience)** Induction motor,synchronousmotor, brushlessDCmotor,dcmotor, singlephase, three phaseMotor rewindingDesign and fabrication of reactor/ electromagnet for different inductance values. Design and fabrication of single phaseInduction motor / three phase induction motor / alternator,
VI	**Electricvehicleandbatteries** BrushlessDCmotor,Reluctancemotor,SynchronousreluctancemotorHarnesswiring,Maintenanceofelectric vehicle, Battery management system
VII	**Electricmotors**
	1. Dismantleandassembleanyavailableelectricmotorfromabovelist 2. Removingtheoldwindingofmotor 3. Familiaritywithrewindingmachine 4. Rewindingofelectricmotor. 5. Maintenanceofmotorfordifferentfaults.
VIII	**DomesticappliancesforHeatingpurpose-Waterheater,Geyser,Roomheater,Electriciron,Oven,Microwave oven** 1. Maintenanceofwaterheater, 2. MaintenanceofGeyser 3. Maintenanceofroomheaterfordifferentfaults. 4. Dismantleandassembletheelectric iron. 5. Maintenanceofelectricironfordifferentfaults. 6. Maintenanceofoven 7. Maintenanceofmicrowaveoven **DomesticappliancesforCoolingpurpose-Refrigerator,Airconditioner** 1. Maintenanceofrefrigerator 2. Maintenanceofwatercooler 3. Checkandreplacethermostatandrelayofrefrigerator. 4. Maintenanceofwindowairconditioner 5. Splitair conditioner 6. Centralairconditioningsystem **DomesticappliancesusingMotors-Mixer,GrinderWashingmachine,ceilingfan,tablefan,blowerfan, water pump** **1.** Dismantleandassembletheceilingfan. **2.** Dismantleandassemblethetablefan. **3.** Dismantleandassembletheblower fan. **4.** Connectionoftableandceilingfanswithregulators. **5.** Maintenanceofceilingandtablefanfordifferentfaults **6.** Testingofdifferentpartsofwashingmachine. **7.** PreventiveMaintenanceandmaintenanceofofwaterpump, **8.** PreventiveMaintenanceandmaintenanceofwashingmachinefordifferentfaults. **9.** Dismantleandreassemblemixerandgrinder. **10.** Checkandreplacethermostatandrelayofrefrigerator. **11.** Checktheinternalconnectionsandidentifythefaultinmicrowaveoven. **12.** Maintenanceofrefrigeratorfordifferentfaults. **13.** Maintenanceofovenfordifferentfaults. **14.** Maintenanceofmixerandgrinderfordifferentfaults. **DomesticappliancesforEnergystorage-SMPS,UPS** 1. PracticalstudyofSMPS. 2. Practicalstudyof UPS. 6. Practicalstudyofhomeinverter.
IX	**Electricalworkshopvisit**
	Studyoftroubleshootingofelectricalequipmentbasedonactualvisittorepairworkshop.
	Listofexperiments/jobstobepreparedbystudents Note : -List of practicals / jobs is not restricted to following topics. Faculty can add new experiment / job related to subject to encourage project based learning. 7. Studentshavetoprepareanyonejobfromeachgroupofthegivenlist
	Group1wiring andcables

	1. Prepareabattenwiringsample **2.** Prepareconduitwiringsample **3.** Staircasewringmodel **4.** Godownwiringmodel **5.** Drawingcrosssectionalviewofdifferenttypesofcables. **Group2 Rewinding** **6.** Rewindingof choke **7.** Manufacturingsmalltransformer **Group3RenewableGeneration** **8.** Preparationofkitforapplicationofsmallsolarpanel **9.** manufacturingofsmallhorizontalaxiswindturbinemodel **10.** manufacturingofsmallverticalaxiswindturbinemodel **Group4maintenanceofhomeappliance** **11.** MaintenanceofCeilingfan **12.** Maintenanceoftablefan **Group5laboratoryequipmentmaintenance** **13.** Maintenanceofdimmerstat **14.** Dismantleandassembleanyavailableelectricmotorfromabovelist **15.** Studyofelectricitybill,computationofelectricitybillforhomeforgiven load **16.** Studyofspecificationofallelectricalequipmentlikemotors,,generator,transformer,appliances **Group6chargerandbattery** **17.** Powersupplyforchargingmobilephones **18.** Energyauditpreliminaryenergyauditofanyindustry **19.** Maintenanceofbatteryleadacidbattery.Keeplevelofacidintheleadacidbatteryusingdistilled water **20. Group6loadbankandearthresistance** **21.** Preparationoflampbankwithfacilityofdifferenttypesofconnections **22.** Preparationofinductivelampwithfacilityofdifferenttypesofconnections **23.** Preparationof3phaseCapacitivebank **24.** preparationofbriderectifierusingbreadboard **25.** Measurementofearthresistancewithearthtesterfordifferenttypesofsoilslikesanddrysoil,wetsoil **Group7maintenanceofelectricalaccessories** **26.** Developmentofsmallsolarpumpingsystem model **27.** Dismantlingandassemblyofrelay **28.** Dismantlingandassemblyofcontactor **29.** Developmentofextensionboard **Group8industrial visit** 8. Industrialvisitcablemanufacturingplant/transformermanufacturingplant
	Projectbasedlearning: 1. Prepareabattenwiringsample 2. Prepareconduitwiringsample 3. Rewindingofchoke 4. Manufacturingsmalltransformer 5. Preparationofkitforapplicationofsmallsolarpanel 6. Industrialvisitcablemanufacturingplant/transformermanufacturingplant 7. MaintenanceofCeilingfan 8. Maintenanceoftablefan 9. Maintenanceofdimmerstat 10. Dismantleandassembleanyavailableelectricmotorfromabovelist 11. Staircasewring model 12. Godownwiring model 13. Studyofelectricitybill,computationofelectricitybillforhomeforgivenload 14. Measurementofearthresistancewithearthtesterfordifferenttypesofsoilslikesanddrysoil,wetsoil 15. Powersupplyforchargingmobilephones 16. Energyauditpreliminaryenergyauditofanyindustry 17. Maintenanceofbatteryleadacidbattery.Keeplevelofacidintheleadacidbatteryusingdistilledwater 18. Preparationoflampbankwithfacilityofdifferenttypesofconnections 19. Preparationofinductivelampwithfacilityofdifferenttypesofconnections 20. preparationofbriderectifierusingbread board 21. manufacturingofsmallhorizontalaxiswindturbinemodel 22. manufacturingofsmallverticalaxiswindturbinemodel

	23. Developmentofsmallsolarpumpingsystem model 24. Dismantlingandassemblyofrelay 25. Dismantlingandassemblyofcontactor 26. Developmentofextensionboard 27. Studyofspecificationofallelectricalequipmentlikemotors,,generator,transformer,appliances 28. Drawingcrosssectionalviewofdifferenttypesofcables.

1. **ReferenceBooks:**
2. S.Rao,TestingCommissioningOperationandMaintenanceofElectricalEquipment,Khannapublishers.
3. S.K.Shastri–PreventiveMaintenanceofElectricalApparatus–KatsonPublicationHouse.
4. B.V.S.Rao–OperationandMaintenanceofElectricalEquipment–AsiaPublication.
5. S.L.Uppal,ElectricalWiringandCostingEstimation,KhannaPublishers,NewDelhi.
6. SurjitSingh,Electricalwiring,EstimationandCosting,DhanpatRaiandcompany,NewDelhi.
7. RainaK.B.andBhattacharyaS.K.,ElectricalDesign,EstimatingandCosting,TataMcGrawHill,NewDelhi
8. HandbookofconditionmonitoringbyB.K.N.Rao,ElsevierAdvanceTech.,Oxford(UK).
9. B.L.Theraja,A.K.Theraja,"ElectricalTechnology",Vol-II,S.Chandpublication.
10. A.K.Sawhney,"ACourseinElectricalandElectronicmeasurementsandInstrumentation",DhanpatRai publication.
11. Uppal,Electriclestimationandcosting
12. Arora,Electricalestimationandcosting

BharatiVidyapeethDeemedtobeUniversity,Pune
Faculty of Engineering & Technology
Programme:B.Tech(ElectricalEngineering)Sem–II(2021Course)

MathematicsforElectricalEngineering

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:-04
Tutorial:01Hours/Week	ContinuousAssessment:40Marks	Tutorial:-01
		Total:- 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

Algebraofmatrices,probabilityandnumericalmethodsforalgebraicequations.

CourseObjectives:

To study

- Rankofmatrixandtestconsistencyofsystemoflinearequations.
- FourierseriesandFouriertransformtechnique.
- Finitedifferencemethods,probabilitytheoryandgraphtheory.

CourseOutcomes: Studentswillbeableto

1.	Understandrankofmatrixandtestconsistencyofsystemoflinearequations.
2.	Understandtorepresentperiodicfunctionas Fourierseries.
3.	UnderstandthemethodstofindFourierandZtransform.
4	Understandvariousnumericaltechniqueforordinaryandpartialdifferentialequation..
5	Understandthehypothesistechniques.
6	Understandtheconceptofgraphanditsapplicationsoftree.

UNIT-I	**LinearAlgebra:Matrices:**	**(08Hours)**
	Rank,Normalform,SystemofLinearEquations,LinearDependenceandIndependence,Linearand OrthogonalTransformations.Eigenvalues,EigenVectors,Cayley–HamiltonTheorem.Applicationto problems in Engineering	
UNIT- II	**FourierSeriesanditsapplications:**	**(08Hours)**
	Definition,Dirichlet'sconditions,FourierSeriesandHalfRangeFourierSeries,HarmonicAnalysis	
UNIT-III	**FourierTransformandZ-Transform:**	**(08Hours)**
	Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses.SolutionofSimpleDifferenceEquations	
UNIT-IV	**FiniteDifferenceMethods:**	**(08Hours)**
	Finite difference methodsforsolving second order two - point linear boundary valueproblems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangulardomain–Onedimensionalheatflowequationbyexplicitandimplicit(CrankNicholson) methods–Onedimensionalwaveequation byexplicitmethod.	
UNIT-V	**ProbabilityandProbabilityDistributions:**	**(08Hours)**
	Probability,BayesTheorem,Probabilitydensityfunction,Probability distributions:Binomial,Poisson, Normal, Test of hypothesis: Chi-square test, t-test.	
UNIT- VI	**Graphtheory:**	**(08Hours)**
	Introductiontographs,graphterminology,representinggraphsandgraphisomorphism,connectivity, EulerandHamiltonpaths,planargraphs,graphcoloring,introductiontotrees,applicationoftrees.	

Projectbasedlearning:

1. EigenvaluesandEigenvectors
2. CayleyHamiltontheorem
3. Systemoflinearequations
4. FourierSeries
5. HarmonicAnalysis
6. Waveequation
7. OneDimensionalHeatEquation
8. TwoDimensionalHeatEquation

9. Coefficientofvariation
10. Reliabilityofregressionestimates
11. Chisquaretest
12. Theoreticalprobabilitydistribution
13. Bayestheorem
14. Isomorphismofgraphs
15. Coloringofgraphs
16. Planergraph

TextBooks:

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune 2013.
2. B.S.Grewal,HigherEngineeringMathematics,42thEd.,KhannaPublication,Delhi
3. B.V.Ramana,HigherEngineeringMathematics,6thEd.,TataMcGraw-Hill,NewDelhi,2008.

ReferenceBooks:

1. ErwinKreyszig,AdvancedEngineeringMathematics,10thEd.,JohnWiley&Sons,Inc.,2015.
2. PeterV.O'NeilAdvancedEngineeringMathematics,7thEd.,CengageLearning,2012.
3. MichaelGreenbergAdvancedEngineeringMathematics,2ndEd.,PearsonEducation,1998.

SyllabusforUnitTest:

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

ModernPhysics

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:-03
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:- 01
	TermWork:50Marks	Total:- 04

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

- BasicunderstandingofPhysicsandCalculus.

CourseObjectives:

- To impart knowledge of basic concepts in physics relevant to engineeringapplications in a broader sensewith a view tolayfoundation for the Electrical and Computational Engineering.

CourseOutcomes: Studentswillbeableto

1. Interprettheelectricandmagneticfieldsandapplytheprinciplesof Coulomb'sLawand Gauss'slawtoelectricfieldsinvarious coordinate systems.
2. Summarizethemagnetism,differentmagneticmaterialsanditsproperties.
3. Explainmechanicalpropertiesofsolidmatter,andconnecttoapplicationsinthefieldofengineering.
4. Interpretthepropertiesofnucleusandapplyitforsocioeconomicpurposes.
5. Interpretthesuperconductivityandperfectdiamagnetism,andgiveaqualitativedescriptionoftheMeissnereffectandits applications.
6. Summarizethestructureandpropertiesoflaserstotheirperformanceandintendedapplicationssuchasopticalfiberinthefield of communication.

UNIT-I	**ElectromagneticTheory:**	**(06Hours)**
	IntroductionofElectrostatics:electricchargeandelectricfield,electricpotential,electricdipole,Gauss'slaw for electric field on integral form, Capacitors, electrostatic energy. Stationary electromagnetism: magnetic fields and flux density and magnetic forces, Ampere's law for B-field in integral form, Electromagnetic induction: Faraday's and Lenz' laws, self and mutual inductance.	
UNIT- II	**MagnetismandDielectricMaterials:**	**(06Hours)**
	Origin of magnetism, Classification of magnetism on the basis of permeability (qualitative), Domain theory of ferromagnetism, Hard and soft magnetic materials, Dielectric parameter (Dielectric constant, Electricdisplacement,Polarization&Polarizability),Typesofpolarizationanddielectricmaterials, temperature and frequency effect, Applications of magnetic devices: transformer cores, magnetic storage.	
UNIT-III	**SolidStatePhysics:**	**(06Hours)**
	Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bandsinsolids,Effectivemassofelectron,Fermi-Diracprobabilityfunctionandpositionof Fermilevel inintrinsicsemi-conductors(withderivation)andinextrinsicsemi-conductors,Bandstructureofp-n junctiondiodeunderforwardand reverse biasing, Conductivity in conductorandsemi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.	
UNIT-IV	**NuclearandParticle Physics:**	**(06Hours)**
	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, Nuclearfusion and thermonuclearreactions (Stellar reaction),Merits and demerits of nuclear energy, Fundamental forces, Particle physics, Quark model, Neutrino properties and their detection.	
UNIT-V	**Superconductivity:**	**(06Hours)**
	Introduction to superconductivity; Properties of superconductors: zero electrical resistance, critical fields, persistent current, Meissner effect- Type I and Type II superconductors, Low and high temperature superconductors (introductionand qualitative), AC/DC Josephson effect; SQUID: basic construction and principle of working, Applications of SQUID, Applications of superconductors.	
UNIT- VI	**LaserandFibreOptics:**	**(06Hours)**
	Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, Computers).Principleoffibreoptics,Construction,NumericalApertureforstepindexfibre,critical	

	angle, angle of acceptance, types of optical fibres, Fibre optic communication system, advantages and disadvantages of fibre optics.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsfrombelowlist.

1. StudyofchangingmagneticfluxandinducedcurrentassociatedwithFaraday'sLawofInduction.
2. PlottingthehysteresisloopforgivenmagneticmaterialTostudyHalleffectanddeterminetheHallvoltage
3. Calculationofconductivitybyfourprobemethod
4. StudyofsolarcellcharacteristicsandcalculationoffillfactorDeterminationofbandgapofsemiconductor
5. DeterminationofdivergenceofalaserbeamParticlesizebysemiconductorlaser
6. DeterminationofwavelengthoflaserbydiffractiongratingConstructionandapplicationofheatsensorinprocesscontrol

Projectbasedlearning:

1. Designandsimulationofautomaticsolarpoweredtimeregulatedwaterpumping
2. Solartechnology:analternativesourceofenergyfornationaldevelopment
3. Thestudyontheeffectoflengthontheresistanceofacopperwire(verificationofohmslawrdirectlyproportionaltol)
4. Possibleeffectsofelectromagneticfields(emf)onhumanhealth
5. Designandconstructionofdigitaldistancemeasuringinstrument
6. Designandconstructionofremotecontrolfan
7. Designandconstructionofsoundorclapactivated alarm
8. Electroniceye(LaserSecurity)asautoswitch/securitysystem
9. Electricpowergenerationbyroad power
10. Wirelesspowertransfer
11. DeterminationofvelocityofO-rayandE-rayindifferentdoublerefractingmaterials
12. Smallwindturbinesasasourceofelectricity
13. TeslaCoil
14. LiFi-wirelessdatatransfersystemusing light

TextBooks:

1. ATextbookofEngineeringPhysics, MNAvadhanulu,PGKshirsagarandTVSArunMurthy,S.ChandPublishing(2018)
2. EngineeringPhysics,RKGaurandSLGupta,DhanpatRaiPublishingCoPvtLtd(2015)
3. ConceptsofModernPhysics,ArthurBeiser,ShobhitMahajanandS.RaiChoudhury,McGrawHillEducation(2017)

ReferenceBooks:

1. FundamentalsofPhysics,JearlWalker,DavidHallidayandRobertResnick,JohnWileyandSons(2013)
2. Optics,FrancisJenkinsandHarveyWhite,TataMcgrawHill(2017)
3. PrinciplesofPhysics,JohnW.Jewett,Cengagepublishing(2013)
4. IntroductiontoSolidStatePhysics,C.Kittel,WileyandSons(2004)
5. PrinciplesofSolidStatePhysics,H.V.Keer,NewAgeInternational(1993)
6. LaserandNon-LinearOptics,B.B.Laud,NewAgeInternationalPrivateLimited(2011)
7. Nanotechnology:PrinciplesandPractices,Dr.S.K.Kulkarni,CapitalPublishingCompany(2014)
8. ScienceofEngineeringMaterials-C.M.SrivastavaandC.Srinivasan,NewAgeInternationalPvt.Ltd.(1997)
9. IntroductiontoElectrodynamics–DavidR.Griffiths,Pearson(2013)
10. RenewableEnergy:PowerforaSustainableFuture, Boyle,OxfordUniversityPress(2012)

SyllabusforUnitTest:

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

InstrumentationandMeasurements

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Practical:25Marks	Total:05

CoursePre-requisites:

TheStudentshouldhaveknowledge of

1.	BasicelectricalEngineeringParameterssuchasVoltage,Current,Power,Energy,etc.

CourseObjectives:

This course introduces knowledge about electrical measurements and instrumentation. The course is designed to learn different methods of measurements of various electrical parameters and also to learn the different physical parameters with the help of the various measurement and instrumentation techniques.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Explaintheimportanceofmeasurementandabletofindtheresistance,inductanceandcapacitanceusingvariousmethods.
2	Explaintheconstruction,workingprincipleofwattmeterandEnergymeterandapplytheknowledgetomeasurethepower and energy.
3	Draw block diagram, state specifications, functions of various digital/automated meters, harmonic analyzer. Observe the waveforms and measure the voltage, current, phase and frequency on CRO and to use DSO.
4	Define,classifytransducersandmeasurethedisplacement,levelandflowusingvariousmethods.
5	Explainprincipleofoperation,characteristicsofPressure,temperature,velocitytransducersanddifferentmethodsof measurement.
6	Illustrateandexplaintypesofdisplaydevicesandrecorders.

UNIT–I	**Measurementofcircuitparameters**	**(08Hours)**
	Introduction: Classification of measuring instruments, Static characteristics: Error in measurements, sources of error. Dynamic characteristics: standard. Instrument transformers. **MeasurementofResistance**–Classificationofresistances,Measurementofmediumresistance– Ammeter-voltmetermethod,Wheatstonebridge.MeasurementofLowresistance–KelvinDouble bridge. Measurement of high resistance – difficulties, use of guard circuit, Methods: direct deflection, loss of charge, Megger. Measurement of earth resistance – Fall of potential method, earth tester. Localization of cable faults. **MeasurementofInductanceandCapacitance** **ACBridges:**Introduction,sourcesanddetectorsforacbridge,generalequationforbridgebalance. General form of ac bridge. Measurement of Inductance: Maxwell's Inductance, Hay's bridge, Anderson's Bridge, Owen's bridge. MeasurementofCapacitance-DeSauty'sbridge,ScheringBridge,HighvoltageScheringbridge.	
UNIT- II	**MeasurementofPowerandEnergy**	**(08Hours)**
	Measurement of Power: Construction, working principle, torque equation, advantages/disadvantages, errors and their compensation of dynamometer type wattmeter, low power factor wattmeter, Active & reactive power measurement in three phase balanced & unbalanced system (one wattmeter and two wattmeter methods), Power Measurement using Instrument Transformer, Three Phase wattmeter. **Measurement of energy:** Energy Meters in AC circuits, Single Phase Induction Type Energy Meter- Construction,principleofoperation,torqueequationofinductiontype energymeter, errors and adjustments. Three phase three wires, and three phase four wire energy meter, electronic energy meter	
UNIT-III	**ElectronicDevicesandSignalAnalyzer's**	**(08Hours)**
	ElectronicVoltmetersandtheirAdvantages,VacuumTubeVoltmeters,differenceAmplifierType Voltmeters, DC Voltmeters with direct Coupled Amplifier, Measurement of Power at Audio and RadioFrequencies.Conceptof:Numericmeter&itstypes(TOD,ABT,Prepaid&panelmounted meters. Measurement ofpower & energyby sampling technique automaticmeter reading(AMR) andadvancedmeteringinfrastructure(AMI),Meterreadinginstrument(MRI).WaveAnalyzers –	

	FrequencySelectiveWaveAnalyzersandHeterodyneWaveAnalyzersanditsapplications. Harmonic Distortion Analyzer, Spectrum Analyzer, Standing Wave Ratio, Power Analyzer. CROandDigitalStorageOscilloscope–Principleofoperationandwaveformreconstruction.	
UNIT-IV	**Displacement,LevelandFlowMeasurement**	**(08Hours)**
	Introduction toTransducers, classification, basicrequirementsfor transducersand Advantagesof Electrical Transducers. **Displacementmeasurement:**Potentiometerasdisplacementtransducer**,**StrainGauge:Theoryof Strain Gauges, Types of strain gauges: Un-bonded and Bonded types their construction, working, advantages and disadvantages, load cell, LVDT & RVDT – construction, working, application, null voltage, specifications, advantages/disadvantages, effect of frequency on performance. Capacitive transducers – Advantages, Disadvantages and Applications. **Level measurement:** Introduction and importance of level measurement, level measurement methods: mechanical, hydraulic, pneumatic, Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors **Measurement of flow –** Rate of flow**,** Turbine Meter, Electromagnetic Flow Meters, Hot Wire Anemometer, Ultrasonic Flow Meter.	
UNIT-V	**Pressure,TemperatureandVelocityMeasurement**	**(08Hours)**
	Pressure Measurement: Introduction, Types of Pressure Measurements Devices, Pressure Measurement using Electrical Transducers as Secondary Transducers. Low Pressure (vacuum) Measurement – Thermocouple Vacuum Gauge, Pirani Gauges and Ionization Type Vacuum. **Temperature Measurement:** Electrical Resistance Thermometer, Platinum Resistance Thermometer, Semiconductor Thermometers, Thermocouples, Thermistors, Quartz Crystal Thermometers,BimetallicThermometers.Electricalmethodsoftemperaturemeasurement–signal conditioning of industrial RTDs and their characteristics – 3 lead and 4 lead RTDs. **Measurement of Velocity** – Measurement of Linear Velocity: Electromagnetic transducers, MovingMagnetType,MovingCoilType,MeasurementofAngularVelocity:Electrical Tachometers.ElectromagneticTachometerGenerators.PhotoelectricTachometer.	
UNIT-VI	**DisplayDevicesandRecorders**	**(08Hours)**
	DisplayDevices: Introduction,electricalIndicatingInstruments.DigitalInstruments:Advantages of DigitalInstruments. Digitalversus Analog Instruments. Digital Display Methods, Digital display Units,Rear Projector Display, LightEmitting Diodes (LED), Liquid CrystalDiodes (LCD),Resolution, Sensitivity, accuracy and specifications of Digital Meters. **Recorders:** Necessity of Recorders. Recording Requirements. Analog Recorders. Graphic Recorders.StripChartRecorders,NullTypeRecorders,X-YRecorders,UltravioletRecorders, DirectRecorders.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

3. MeasurementofresistancebyKelvindoublebridge/Wheatstonebridge/Ammeter-voltmetermethod
4. MeasurementofcapacitanceandlossanglebySCheringBridge.
5. MeasurementofinductancebyAnderson'sbridge/Maxwell'sInductanceBridge.
6. Measurementofresistance,capacitanceandinductanceusingLCRmeter.
7. Tomeasurepowerinthreephasesbalancedloadbyonewattmetermethod.
8. Tomeasurepowerinthreephasebalanced/unbalancedloadbytwowattmetermethod.
9. Tomeasurereactivepowerinthreephasecircuitbyonewattmetermethod.
10. Tocalibratesinglephaseenergymeterat(i)unitypowerfactor(ii)0.5lagging powerfactor(iii)0.5leadingpowerfactor (analog /Digital)
11. MeasurementofVoltage,currentandresistanceusingdigitalvoltmeteranddigitalmultimeter.
12. TostudyandanalyzethevariouselectricalparametersusingPowerAnalyzer.
13. TostudytheobservationofwaveformsonCRO,measurementsofvoltageandcurrent,measurementofphaseand frequency using CRO / digital storage oscilloscope
14. DisplacementmeasurementusingLVDT.
15. Strainmeasurementusingstraingauge.
16. Studyofprocesscontrolapplicationofusingtheinstrumentationkit.
17. MeasurementofPressureusingBellows,Bourdongauge,Diaphragm.
18. Calibrationofvacuumgaugeusingvacuumgaugetester.
19. CharacterizationofRTD(PT100)

ProjectBasedlearningtopics

1. Measurementofvoltageandcurrentusinginstrument transformers

2. Calibrationofvoltmeter,ammeter,wattmeter(Usingpoweranalyser)
3. Measurementofearthresistance
4. Measurementofinsulationresistance.
5. Design/development/simulationofmeasurementofanyphysicalparameterusingtransducer/s.
6. Demonstrationof7segmentLEDformeasurement
7. Selectionofdigitalinstrumentforspecificapplicationusingusermanual/datasheet

TextBooks:

1. ACourseinElectricalandElectronicmeasurements&Instrumentation –byA.K.Sawhney,DhanpatRai&Sons.
2. ElectronicInstrumentation:H.S.Kalsi–THM,2nd Edition2004.
3. ACourseinElectronicandElectronicmeasurementsbyJ.B.Gupta,S.K.Kataria&Sons.

ReferenceBooks:

1. ElectricalMeasurement&MeasuringInstrumentsFifthedition,byE.W.Golding&Widdies,A.H.Wheeler&Co.Ltd.
2. ElectronicmeasurementandinstrumentationbyDr.RajendraPrasad,KhannaPublisher,NewDelhi.
3. IntroductiontoMeasurementsandInstrumentation,SecondEditionbyGhosh,PHIPublication.
4. IntroductiontoMeasurementsandInstrumentationbyAnand.PHIPublication

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT– II,UNIT- III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

IndustrialSafetyPractices

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITS:
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25MarksOral:25Marks	Total:05

CoursePre-requisites:

Studentsshouldhavebasicknowledgeofsafetypractices

CourseObjectives:

1. Tomakestudentsawareaboutthehazardswhileworkinginindustryandrespondappropriatelyinanemergency.
2. Tohelppreventworkplaceinjuries,illnessesandfatalities.
3. Toreduceandremoveexistingdangerstoimproveworkingconditions.

CourseOutcomes:

Studentsareexpectedto:

1	Tounderstandimportanceofsafety
2	Tounderstandprocesssafetymanagement
3	Toevaluatesafetyinhazardousarea
4	Toapplytheknowledgeof Industrialsafetyengineering
5	ToreviewofIErulesandactsandtheirsignificance
6	ToanalysecasestudiesonIndustrialSafetyPractices

Topicscovered

UNIT-I	**ImportanceofSafety:** Health and environment. Health safety and environmental policy, fundamentals of safety, classification of accidents, Managements responsibility, objectives of safety management, National safety council, Employees state insurance act 1948, approaches to prevent accidents, principles of safety management, safety organization, safety auditing, maintenance of safety, measurementsofsafetyperformance,industrialnoiseandnoisecontrol,IndustrialPsychology, Industrial accidents and prevention.	**(08Hours)**
UNIT- II	**Processsafetymanagement:** Process safety management, legal aspects of safety, safety with respect to plant and machinery, the explosive act 1884, Petroleum act 1934, personal protective equipment, classification of hazards, protection of respiratory system, work permit system, hazards in refineries and process plants,safetyinprocessplants,pollutioninsometypicalprocessindustry.Safeworkingpractices, housekeeping, safe working environment, safety device and tools, precaution in use of ladders, safety instruction during crane operation, safety instruction for welding, burning and cutting and gas welding equipment, electrical safety, case studies, safety in use of electricity, electric shock phenomena,occurrenceofelectricshock,medicalanalysisofelectricshockanditseffect,safety procedures in electric plants, installation of Earthing system.	**(08Hours)**
UNIT-III	**Safetyinhazardousarea:** Hazard in industrial zones, classification of industrial Enclosures for gases and vapors. Mechanical,Chemical,EnvironmentalandRadiationhazards,Machineguardsandsafetydevices, slings, load limits, lifting tackles and lifting equipment, hydrostatic test, Chemical hazards, industrial toxicology, toxic chemicals and its harmful effects on humans, factors influencing the effect of toxic materials, Unitsof concentration, control measure, environmentalhazards, devices for measuring radiation, safety analysis and risk analysis, risk management, First aid, Safety measurestoavoidoccupationaldiseases.	**(08Hours)**
UNIT-IV	**IndustrialSafetyEngineering:** IndustrialLighting:Purposeoflighting,Usesofgoodillumination,recommended optimum standards of illumination, Design of lighting installation, Standards for lighting and colour. VibrationandNoise:Activitiesrelatedtovibrations,itsimpactonhumanhealth,abatement Sources, effects ofnoise on man, Measurement and evaluation ofnoise, Silencers, Practical aspects of control of noise. SafetyatvariousIndustries:Agro-Industry,SugarIndustry,TextileIndustryetc.	**(08Hours)**
UNIT-V	**ReviewofIErulesandactsandtheirsignificance**:	**(08Hours)**

	Objectiveandscope–groundclearancesandsectionclearances –standardsonelectricalsafety- safe limits of current, voltage –Rules regarding first aid and fire fighting facility. The Electricity Act, 2003.	
UNIT-VI	**CasestudiesonIndustrialSafetyPractices:** Case studies in various industries like: Processing industry, Hazardeous material industry, Engineering applications industry etc	**(08Hours)**

Practicals:

ListofPractical'stobeperformedinthelaboratory:

1. Demonstrationandtrainingofhowtousebreathingapparatus,
2. DemonstrationandtrainingofEmergencyevacuationdrill,
3. Trainstudentshowtorescueemployeesusingemergencyrescueequipmentsinsideconfinedspace.
4. Withthehelpofgasdetectortrainstudentscheckthelevelofoxygenandother,Gasesinindustries,
5. Trainingofusingofwindometertomeasurespeedlevelofwind,
6. Trainstudentsusenoiselevelmeterandfindoutdifferentlevelofnoiseofdifferentequipmentsandteachthemhowtobe safe,
7. Trainstudentshowtousepersonalprotectiveequipment,
8. FirstAidtraininganddemonstration.

Projectbasedlearning:

1. StudyofHomeAndIndustrialSafetyUsingFireAndGasDetectionSystemkit/system
2. IndustrialIoTSafetyproject(IIOT):IndustrialInternetofThingsusingArduino&ESP8266
3. StudyofAnti-CollisionLight:LGKT017SimpleCircuitProject
4. StudyofFirstAidKits&ConstructionSafety
5. StudyofPersonalProtectiveEquipment(PPE)Kitforindustry
6. StudyofElectricalSafetyKitforindustry
7. Casestudieson–LearningindustrialSafetythroughfilms/Videos
8. Casestudieson–LearningindustrialSafetythroughposters/charts
9. Casestudieson–LearningindustrialSafetythroughperiodicals,researchpublications
10. Conductingelectricsafetyauditofanyinstitute/Engineeringcollege
11. Conductingpowerqualityauditofanyinstitute/Engineeringcollege
12. Autopowersupplycontrolfrom4differentsources
13. OverVoltage/UnderVoltageElectricalApplianceProtector
14. ATMMachineGateSecuritySystem
15. Do-it-yourselfintelligentcamera

Note:
Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.

Projectbasedlearning: Studentshalldemonstrateminimumoneconceptbasedonsyllabustopic.

ReferenceBooks:

1. IndustrialsafetymanagementBy:L.M.DeshmukhPublishers:TataMcGrawHill,NewDelhiYear:2006Edition:First
2. Industrialsafetyhealthandenvironmentmanagementsystem By:R.K.Jain&SunilS.RaoPublishers:KhannaPublishers Year: 2008 Edition: Second

UnitTest:

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

ObjectOrientedProgrammingwithC++

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:04 Hours/Week	EndSemesterExamination:60Marks	Theory:-04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:-01
	TermWork:25Marks&Practical:25Marks	Total:- 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1. CProgramming

CourseObjectives:

This course introduces knowledge aboutlanguage C++ and various parameters associated with programming with C++. The objectorientedprogrammingwithC++playsimportantroleincreatingplatformforotheradvancedprogramming languages. This course is considered as strong foundation for software related advancements.

CourseOutcomes: Studentswillbeableto

1. Defineanddescribethebasictermsandideasaboutobjectorientedapproachalongwithimportantparadigms.

2. IllustratethefunctionofvariousclassesandobjectsunderobjectorientedapproachwithC++

3. Analyzethesignificanceofinheritanceanditsapplication.

4 Describepolymorphismalongwithhierarchies,categorization,methodsofpolymorphism.

5 Describevariousfilesandexaminethemunderobjectorientedapproachfollowedbyexceptionhandling.

6 Exploreconceptofpointer,arraysandtheirsignificanceinC++programming.

UNIT-I	**IntroductiontoObjectOrientedProgramming:**	**(08Hours)**
	Introduction to Object Oriented Approach, Overview of other paradigms {Functional, Data decomposition}, Basic terms and ideas about Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++, cin, cout, new, delete, operators.	
UNIT- II	**ClassesandObjects:**	**(08Hours)**
	Encapsulation,Informationhiding,Abstractdatatypes,Object&classes,Attributes,Methods,C++ classdeclaration,Stateidentityandbehaviorofanobject,Constructorsanddestructors,Instantiation ofobjects,Defaultparametervalue,Objecttypes,C++garbagecollection,Dynamicmemory allocation, Meta class / abstract classes.	
UNIT-III	**Inheritance:**	**(08Hours)**
	Inheritance,Definingderivedclasses&Visibilitymodes,Single,Multilevel,Multiple,Hierarchical and Hybrid inheritance, Virtual base classes & Abstract classes-, Constructors in derived classes, Nesting of classes.	
UNIT-IV	**Polymorphism:**	**(08Hours)**
	Composition Vs. Classification, Hierarchies, Polymorphism, Categorization of polymorphism techniques, Methodpolymorphism, Polymorphismbyparameter, Operatoroverloading,Parametric Polymorphism.	
UNIT-V	**FilesandExceptionHandlinginC++programming:**	**(08Hours)**
	Objectoriented Language, Application of OOP,Introduction to C++,Application of C++,Program Features, Comments, Output Operators, Iostream File, Namespace, Return Type of main (), Exceptionhandling,GenericClasses,Throwinganexception,catchinganexception:Thetryblock, Exceptionhandlers,Terminationvs.Resumption,Exceptionspecification,rethrowinganexception, uncaught exceptions, Standard exceptions, Programming with exceptions.	
UNIT- VI	**Pointers:**	**(08Hours)**
	Introduction to Pointer, Declaration and Initialization of Pointer; Dynamic memory allocation/deallocation operators: new, delete; Pointers and Arrays: Array of Pointers, Pointer to an array(1dimensionalarray),Functionreturningapointer,Referencevariablesanduseofalias; Function call by reference. Pointer to structure: De-reference/Deference operator: *, ->; self referential structure.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsfrombelowlist.

1. WriteaC++Programtodisplay Names,RollNo.,andgradesof3studentswhohaveappearedintheexamination.Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.

2. WriteaC++programtodeclareStruct.Initializeanddisplaycontentsofmembervariables.
3. WriteaC++programtodeclareaclass.Declarepointertoclass.Initializeanddisplaythecontentsoftheclassmember.
4. GiventhatanEMPLOYEEclasscontainsfollowingmembers:datamembers:Employeenumber,Employeename,Basic, DA, IT, Net Salary and print data members.
5. WriteaC++programtoreadthedataofNemployeeandcomputeNetsalaryofeachemployee(DA=52%ofBasicand Income Tax (IT) =30% of the gross salary).
6. WriteaC++toillustratetheconceptsofconsoleI/Ooperations.
7. WriteaC++program tousescoperesolutionoperator.Displaythevariousvaluesofthesamevariablesdeclaredatdifferent scope levels.
8. WriteaC++programtoallocatememoryusingnewoperator.
9. WriteaC++programtocreatemultilevelinheritance.(Hint:ClassesA1,A2,A3)
10. WriteaC++programtocreateanarrayofpointers.Invokefunctionsusingarrayobjects.
11. WriteaC++programtousepointerforbothbaseandderivedclassesandcallthememberfunction.UseVirtualkeyword.

Assignments:(Projectbasedlearning)

1. Phonebook
2. Temperatureconversiontable
3. Calculator
4. Games(Snake etc.)
5. Studentdata
6. Studentreportcardsystem
7. Calendar
8. PersonalDiaryManagementSystem
9. Busreservationsystem
10. Librarymanagementsystem
11. FacedetectionusingC++
12. DigitalclockinC++
13. Attendancemanagementsystem
14. Students'attendancesystem
15. Biometricsystem

TextBooks:

1. E.Balagurusamy–ObjectOrientedProgrammingwithC++,Fifthedition,TataMcGrawEducationHill,2011.
2. AshokN.Kamthane,ObjectorientedProgrammingwithANSI&TurboC++,FirstEdition,PearsonIndia

ReferenceBooks:

1. RobertLafore,ObjectOrientedProgramminginTurboC++,FirstEdition,GalgotiaPublications.
2. DRavichandran,ProgrammingwithC++,Secondedition,TataMcGraw-Hil
3. TheC++ProgrammingLanguage,3rdEdition,B.Stroutstrup,PearsonEducation.C++ProgrammingLabManual/ II-I SEM / 2019-20 Page 9
4. OOPinC++,3rdEdition,T.Gaddis,J.WaltersandG.Muganda,WileyDreamTechPress.

SyllabusforUnitTest:

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

SimulationAndProgramming

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory: NA	EndSemesterExamination:00Marks	
Practical:02	ContinuousAssessment:00Marks	
	TermWork:25Marks&Practical:25Marks	Total:01

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	StudentsshouldhaveknowledgeofFundamentalsofElectricalEngineering,basicmathematicsandbasiccomputer operation

CourseObjectives:

	Thecourseintroducesfundamentalconceptsofsimulationandprogrammingforproblemsolving

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Describetheconceptofsimulation
2	Identifyandapplyknowledgeofsoftwaresimulation
3	DescribeandAnalyzeProgrammingTechniquesusingapplicationsoftware's.
4	DescribefundamentalconceptsofMATLABSimulink
5	ApplyknowledgeMATLABSimulinkinElectricApplications
6	ElaboratethescopeandapplicationsofPCBdesign

UNIT–I	**IntroductiontoSimulation:**	
	Whatissimulation: Modeling basics, computer simulation (Popularity and advantages, different kinds of simulation), How simulation gets done (byhand,programming in general languages, simulation languages, high level simulators, Uses of simulations (past , present, future). **Fundamentalsofsimulation:** Goals of simulation study, Analysis options(educated guessing, queueing theory, mechanistic simulation), Pieces of simulation model(entities, attributes, variables, resources, queues, statistical accumulators, events, simulation clock, starting and stopping), Event driven hand simulation, Event and process oriented simulation Randomness in simulation, Simulation with spread sheets, conducting simulation studies.	
UNIT- II	**SoftwareToolsandSimulation:**	
	Typesof Analysis: Biaspoint,Timedomain,ACSweep,DCSweep,Parametric,MonteCarlo,Noiseanalysis. **SchematicDesign:** Introduction,DescriptionofP-Spice,Typesofanalysis,Descriptionofsimulationsoftwaretools(like OrCAD / PROTEL / Proteus / Microcap) Schematic Description: Introduction, Input files, element values,Nodes,circuitelements,sources,outputvariables,formatofcircuitandoutputfiles,drawing the schematic, Design rule Check (DRC), Netlist details.	
UNIT-III	**IntroductiontoMATLABprogramming:**	
	Introduction, starting and ending a MATLAB session, Fundamentals of MATLAB programming (MATLAB variables, arrays, matrices, matlab operators- arithmetic, relational, logical, MATLAB graphics(plots, subplots, other types of plots), benchmarking and looping functions(branching functions, looping functions), miscellaneous functions(string function, input/output function), *examples on above topics*, advantages of MATLAB, limitations of MATLAB, various matlab commands & their explanation. Introduction to GUI.	
UNIT-IV	**MATLABSimulinkBasics:**	
	Introduction, Introduction to simulink, starting simulink, simpleexamples on starting a simulink,solvingdifferentialequationsinsimulink,Commonlyusedblocks,applicationblocksets(power systemtoolbox),userdefinedfunctions,Simulinkmodeling.	
UNIT-V	**MATLABBasicElectricalEngineeringApplications:**	
	Basic electrical engineering applications(introduction, elementary definitions, basic waveforms, averagevalue -RMSvalue -peak value, ohmslaw, Kirchhoff'slaws,independentand dependentDc sources,seriesandparallelcircuits,resonancephenomenon,networktheorems,apparentpower-	

	activepower-reactivepower,threephasesourceandloadsimulation,transformers.Application related to Wind and Solar.	
UNIT-VI	**PCBDesignanditsApplications:**	
	Simulationoffollowingcircuits:halfwave&fullwaverectifier,Zenershuntregulator,transistorized RC coupled amplifier, clipper and clamper. Introduction to PCB design.	

TermWork: Thetermworkshallconsistofrecordofminimumeightexperimentsandnotlimitedto

Listofexperiments:

1. Schematicdrawing&componentsymbolcreation
2. Hierarchicalschematicdrawing
3. Simulationandanalysis(biaspointanalysis,timedomain,ACsweep,DCsweep,parametric)of:RLCCircuit.
4. ExperimentsbasedonPCBdesignwhichwouldincludecomponentplacement,settingdesignrules,autoroutingand interactive routing.
5. ExperimentsbasedonnoiseanalysisandMonte-carloanalysis
6. Tosimulatesimplecalculatorthatperformsbasictaskssuchasaddition,subtraction,multiplicationanddivisionwithspecial operations like computing xy and x!.
7. ToacceptthenumberandComputea) squarerootofnumber,b)Squareofnumber,c)Cubeofnumberd)checkforprime, d)factorialofnumbere)primefactors
8. Toacceptwonumbersfromuserandcomputesmallestdivisorand GreatestCommonDivisorofthesetwonumbers.
9. Toacceptanumberfromuserandprintdigitsofnumberinareverseorder.
10. Toinputbinarynumberfromuserandconvertitintodecimalnumber.
11. Experimentonunit3:ListingofsomecommonMATLABcommandsandexecutingwithexamples
12. Experimentonunit4:Basicsimulation projects
13. Experimentonunit5:SolvingnetworktheoremsusingMATLAB

Projectbasedlearning:

1)ProjectbasedonNetworkTheoremsinMATLAB

2)DesignofRegulatedPowersupplyinProteus

3)DesignofElectroniccircuitryforhouseholdapplicationsin Proteus

4)DesignofHouseholdapplicationsonPCB

5)DesignofElectricalbasedapplicationsinMATLAB

Textbook:

1. M.H.Rashid‘IntroductiontoP-spiceusingOrCADforcircuitsandElectronics’–PearsonEducation

ReferenceBooks:

1. UsermanualsofPROTEL,PROTEUS,OrCAD,Microcap.
2. W.C.Bosshart‘PrintedCircuitBoards-Design&Technology’–TataMcGraw-HillPublication.
3. R.G.Dromey,“HowtoSolveitbyComputer”,PearsonEducationIndia;1stedition,ISBN10:8131705625,ISBN-13: 978-8131705629 Maureen Spankle, “Problem Solving and Programming Concepts”, Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978- 0132492645
4. RomanoFabrizio,“LearningPython”,PacktPublishingLimited,ISBN:9781783551712,1783551712
5. PaulBarry,“HeadFirstPython-ABrainFriendlyGuide”,SPDO’Reilly,2ndEdition,ISBN:978-93-5213-482-3
6. MartinC.Brown,“Python:The CompleteReference”,McGrawHillEducation,ISBN-10:9789387572942,ISBN-13: 978-9387572942, ASIN: 9387572943
7. JeevaJose,P.SojanLal,“IntroductiontoComputing&ProblemSolvingwithPython”,KhannaComputerBookStore; First edition, ISBN-10: 9789382609810, ISBN-13: 978- 9382609810
8. SimulationwithArenabyW.DavidKelton,randallP.Sadowski,nancyB.Swets(McGrawHillinternationaledition)
9. MATLABandSIMULINKforengineersbyAgamKumarTyagi(OxfordUniversityPress).
10. MATLABanditsApplicationsinEngineeringbyRajKumarBansal,AshokKumarGoel,ManojKumar Sharma(Pearson India Education Services Pvt Ltd.)
11. IntroductiontoMATLABprogrammingtoolboxandsumulinkbyJaydeepChakravorthy(UniversityPressIndiaPrivate Limited)

Assignments:

Assignmentsshouldbeabletoverifycourseoutcomeandskillsofgroupwork,communicationskills.Oneassignmentoneachunit (total 6 assignments).

BharatiVidyapeethDeemedtobeUniversity,Pune

Faculty of Engineering & Technology

Programme:B.Tech(ElectricalEngineering)Sem–III(2021Course)

DC&ACMachines

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:03 Hours/week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/week	ContinuousAssessment:40Marks	Practical:01
Tutorial:1 Hour/Week	TermWork:25Marks&Practical:25Marks	Total:05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	MagneticPhysics,AC&DC Fundamentals
2.	BasiclawsofrotatingmachineslikeFaraday'sLaw,Lenze'sLaw,etc
3.	BasicsofElectrostaticsandelectromagnetic
4.	Transformeroperation

CourseObjectives:

This course introduces knowledge about rotating machines. The course is designed to learn DC and AC machines with their constructional feature, operating principles, performance characteristics and applications. Also, to learn the different tests on machines and various speed control techniques.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Describe the basics of dc machine, armature reaction, commutation, characteristics & applications of dc generators, dcmotors & identify the different parts.
2	Applytheconceptsofthreephaseinductionmotorandestimatethelosses,differentmotorparameters.
3	Applytheconceptsofinductionmachineandanalyzetheresultsusingdifferenttests,drawphasordiagram,state specifications.
4	Describe&identifythedifferentpartsofsynchronousgenerators,differentexcitationsystems,armaturewindings,estimate winding factor, impedance and reactance by different methods.
5	Drawthecapabilitycurvesofsynchronousgenerators;estimatetheregulationbydifferentmethodsanddescribethe methods of synchronizing alternators.
6	Describeworkingprinciple,characteristicsandapplicationsofsynchronousmotors

UNIT–I	**DCMachines**	**(08Hours)**
	Introduction,BasicElectromagnetic Laws, Emf induced in a coil rotating ina magneticfield, forcesand torques in magnetic field systems, Energy balance, Energy in singly excited magnetic field systems. ConstructionofDCmachines,E.M.F.equationofD.C.generator.Processofcommutation&types, causes of bad commutation and remedies, Basic principle of working of DC motor, Significance of Back e.m.f., Torque equation, Types, characteristics and applications of d.c. motors, Starting, reversing and armature voltage and field control method of speed control, Armature reaction, Losses, efficiency, condition for maximum efficiency and maximum power output. Testing of DC motor: Brake test and Swinburne's test. Maintenance, types.	
UNIT- II	**InductionMachinesPart-I**	**(08Hours)**
	Construction of 3-phase induction motor, Concept of rotating magnetic field, Principle of Operation,ConceptsofSpeed&Slip,Frequencyofrotorvoltage&current,PowerFlowDiagram &developmentofEquivalentCircuits,Losses,Relationshipbetweenrotorcopperloss,rotorinput &grossmechanicalpowerdeveloped,Efficiency,Torque–Slip/Speedcharacteristics,Effectof rotorresistanceonTorque-Slipcharacteristics,Conditionformaximumtorque,Relationsbetween starting, Full load & Maximum torque. Starters.	
UNIT-III	**InductionMachinesPart-II**	**(08Hours)**
	Open circuit and short circuit test, Circle diagram and computation of performance parameters, High Torque Cage Motors - Deep bar & Double cage rotor, Speed control mechanisms. Cogging & Crawling of induction motors, Applications. Maintenance of induction motor. Construction of single-phase induction motor, double revolving field theory, methods of self-starting and types: Resistance start, Capacitor start, Capacitor start-Capacitor run, Shaded Pole motor, equivalent circuit, torque-speed/slip characteristics, applications.	

UNIT-IV	**SynchronousGeneratorsPart-I**	**(08Hours)**
	Multiply excited magnetic field systems, Forces and torques in systems with permanent magnets, Dynamic equations, Winding in machines and materials used in electrical machines. Types of synchronous machines & their constructional features, Excitation Systems. Principle of working,Estimationofwindingfactor,EMFEquation,Rating ofGenerator,Generatoronnoload &balancedload,Armaturereaction&itseffectunderloadpowerfactors,SynchronousImpedance, Equivalent Circuit & Phasor Diagram, Two Reaction Theory model, Estimation of Direct & Quadrature axes Synchronous Reactance by Slip Test, Phasor Diagram.	
UNIT-V	**SynchronousGeneratorsPart-II**	**(08Hours)**
	Power Flow (Transfer) Equations, Power – Power angle relation and Capability Curves of synchronous generators. DCresistancetest, Opencircuit Test& Short CircuitTeston synchronous generator,Determination ofVoltageRegulationbydirectloadtest&byIndirectMethods-EMF,MMF.Losses&Efficiency and Short Circuit Ratio. Parallel Operation of alternators - Necessity, Conditions, Concept of Infinite bus, alternators connectedtoinfinitebusbar,Methodsofsynchronizingalternators(synchronizinglampsand synchro-scope),SignificanceofSynchronizingPowerCoefficient.	
UNIT-VI	**ThreePhaseSynchronousMotor**	**(08Hours)**
	Principleofoperation,Methodsofstarting,EquivalentCircuit&PhasorDiagrams,Pull-in&Pull- Out Torque, Power Flow Equations, Operation with constant excitation & variable load and with Constantload & variableexcitation (VCurves& Inverted VCurves), Phenomenonof Hunting & its remedies, Applications.	

TermWork:

The term work shall consist of record of minimum eight experiments. (Perform any 3 experiments from DC machines and any 2experiments from induction machines and synchronous machines)

1. IdentificationofDCmachinewindingsandresistances.
2. SpeedcontrolofD.C.ShuntmotorbyArmatureandFieldcontrol.
3. BraketestonDCshuntmotor
4. Swinburn'sTestonDCshuntMotor.
5. LoadTestonthreephaseinductionmotor
6. No load & Blocked Rotor Test on three phase induction motor: Determination of Equivalent Circuit Parameters/Plotting Circle diagram
7. Loadtestonsinglephaseinductionmotor.
8. Directloadingtestonalternator
9. Opencircuitandshortcircuittestonalternator–regulationbyemfandmmfmethod
10. Sliptestonsalientpolealternator –regulationbytworeaction theory
11. Synchronizationofalternatorwithbusbar
12. V-Curvesofsynchronousmotor
13. Loadtestonsynchronousmotor

ProjectBasedLearning:

1. Demonstrationandoperationofthreeandfourpointstarter
2. Demonstrationofreversingthedirectionofrotationofdcmotor
3. DemonstrationofverificationofElectromagneticlaws
4. DemonstrationofoperationofInductionMotorasinductiongenerator
5. Toidentifythewindingsofsinglephaseinductionmotor,typesofwindings
6. MATLABbasedprojectDFIG
7. ApplicationbasedMATLABProject:

i) TorquespeedcharacteristicsofDCShuntmotorforCentrifugalPumps,Lifts,WeavingMachine,LatheMachines, Blowers,Fans,Conveyors,Spinningmachines,etc

ii) TorquespeedcharacteristicsofDCSeriesmotorforvacuumcleaner,tractionsystems,sewingmachines,cranes,air compressors etc.

iii) Analysisofperformancecharacteristicsof3-phaseinductionmotor– SquirrelCageIM-forPumpsandsubmersible,Pressingmachine,Lathemachine,Grindingmachine,Conveyor,Flourmills, Compressor And other low mechanical power applications
SlipRingIM-Steelmills,Lift,CraneMachine,Hoist,Lineshaftsandotherheavymechanicalworkshopsetc

iv) TorquespeedcharacteristicsofsinglephaseIMforfans,refrigerators,Air-conditioners,Vacuumcleaners,washing machines, centrifugal pumps, tools, small farming appliances, blowers etc

v) SimilarlyforSinglephaseIM

vi) Alternators

vii) Synchronousmotors

8. MaintenanceofMachines:Preparationofmaintenancescheduleofelectricalmotorsofmachinelaboratory
9. Listthecommonlyusedinstrumentsfor maintenanceandfindoutthevoltagebetweenphasesandbetweenphaseand neutral, test the continuity and insulation, measure earth resistance.
10. Listthecommonlyusedtoolsformaintenance
11. DynamicModelofmachinesinMATLAB

TextBooks:

1. NagrathKothari,"ElectricalMachines",TataMcGrawHill
2. A.E.Fitzgerald,CharlesKingsley,Jr.StephenD.Umans,"ElectricMachinery",TataMcGrawHill
3. M.G.Say,"AlternatingCurrentMachines",PitmanPublishingLtd.
4. AshfaqHusain,"ElectricMachines",DhanatRai&Co.

ReferenceBooks:

1. Dr.S.K.Sen,"ElectricMachinery",WileyEastern
2. B.H.Deshmukh,"ElectricalTechnology",NiraliPrakashan
3. M.G.Say,"AlternatingCurrentMachines",McGrawHill
4. A.S.Langsdroff,"TheoryofAlternatorCurrentMachinery",TataMcGrawHill

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT– II,UNIT–III
UnitTest-2	UNIT–IV,UNIT–V,UNIT–VI

PowerSystemEngineering

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:04 Hours/Week	EndSemesterExamination:60Marks	Theory:-04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:- 01
	TermWork:25Marks	Total:- 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1. Electromagneticenergyconversionsystem
2. Electromagneticsanditsapplications

CourseObjectives:

Thiscourseintroducesknowledgeaboutelectricalpowergeneration,its transmissionanddistribution.Thecourseisdesigned to learn different methods of power generation. Also it focuses on performance of transmission line and distribution system along with its design consideration.

CourseOutcomes: Studentswillbeableto

1. UnderstandblockdiagramsanddescribethefunctionofcomponentsofvariousPowerGenerationtechniquesbyConventional energy Sources.
2. Understand block diagrams and describe the function of components of various Power Generation techniques by nonconventional energy Sources.
3. Defineandanalyzethesignificanceoftermssuchasloadfactor,diversityfactoretconeconomicsofpower generation.
4. Computestringefficiency,sagandR,L,Cparametersofdifferenttypesoftransmissionline.(Designtransmissionlinemodel and understand mechanical components of transmission line.)
5. RepresentTEEandPImodeloflineandanalyzetheperformanceoftransmissionline.
6. Exploredifferenttypeofcables&itscalculationsalongwiththecomputationofperformanceofACdistribution.

UNIT-I	**PowerGenerationtechniquesbyConventionalenergySources**	**(08Hours)**
	Introductiontoenergysources,selectionofsite–classification–generalarrangementsandoperations – functions of each component – types of turbines – electric generators – advantages and disadvantages-listofmajorpowerstations:ofHydroelectric,ThermalandNuclearpowerplants in Indiawithcapacity.Basiclayoutandworkingofdieselandgaspowerplant.Conceptofgrid,typesof grids.	
UNIT- II	**PowerGenerationtechniquesbyNon-ConventionalenergySources**	**(08Hours)**
	Different types of Nonconventional Energy Sources, Comparative benefits over conventional type, contribution of conventional & nonconventional energy sources, Solar energy – Its characteristics, basic concept of solar power plant, major solar power plants in India/world, Wind power plant– schematic arrangement - vertical axis, horizontal axis – electrical generator Hybrid solutions: Wind Turbine, diesel, WT-solar etc. – major wind farms in India / world, Power generationbybiogas,biomass,geothermalenergyandtidalenergy–itstypes, MagnetoHydroDynamics(MHD),Conceptofcarboncredit.	
UNIT-III	**LoadCurvesandEconomicAspects**	**(08Hours)**
	LoadCurves:loadcurve–baseloadstationandpeakloadstation-demandfactor–maximumdemand – averagedemand–diversityofload–loadfactor–diversityfactor–significanceofhighloadfactor &diversityfactor–plantfactor–capacityfactor–connectedload–loaddurationcurve–integrated load duration curve – selection of units. (Simple numericals on various factors) Per capita energyconsumption of developed &developing countries.Concept of cogeneration and captive generation.	
UNIT-IV	**DesignofTransmissionLine**	**(08Hours)**
	Transmission Line Components and its types - Line Supports, Conductors, Insulators, Potential distributionoverastringofinsulators,methodsof equalizingthepotential,stringefficiency.(Simple numericals) Circle Diagram Sag:Catenarycurve – calculationof sag andtension – effectsofwindand iceloadingsag templates – vibration dampers for transmission lines. (Simple numericals) Coronaandinterference,Variouseffects–Skin,Proximity,Ferrantietc. Various Parameters of Transmission Line – Resistance, Inductance and capacitance and their calculation(Simplenumericals).Stringefficiencyandmethodsofimprovingstringefficiency (Simplenumericals).	

UNIT-V	**TransmissionLinePerformanceanalysis:**	**(08Hours)**
	CircuitRepresentationofTransmissionLine:Representationandperformanceofshort,mediumand long transmission line – Surge Impedance Loading (SIL), Characteristic Impedance, Generalized circuitconstants:-Representationofteeandpimodelsoflinesastwoportnetworks–evaluationand estimation of ABCD constants (Simple numericals) –sending end and Receiving end.	
UNIT- VI	**UndergroundCablesandDistributionSystem**	**(08Hours)**
	Underground Cables - Classification – construction - insulation resistance – capacitance– dielectric stress in single core cable (Simple numericals). Grading of cables. Laying of cables – Cable Terminations, cable jointing – causes of failure – cable faults and location of faults. Distribution System – Classification – A.C. distribution connection schemes - requirements of distribution system – design consideration – design of radial, ring distributors for concentrated,distributedloads.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsfrombelowlist.

1. MeasurementofA,B,C,DconstantsofshorttransmissionIine.
2. MeasurementofA,B,C,DconstantsofMediumtransmissionline.
3. MeasurementofA,B,C,DconstantsofLongtransmissionline.
4. DrawingSheetonpowergenerationbyConventionalenergySources
5. DrawingSheetonpowergenerationbynonconventionalenergySources
6. DrawingSheetontypesofinsulator
7. DrawingSheetontypesofcables
8. Industrialvisittocablemanufacturingcompany.
9. IndustrialVisitreportofHPS
10. IndustrialVisitreportofTPS/GASPP
11. IndustrialVisitreportofWPS/SolarPP
12. Designanalysisoftransmissionlinemodelusinganysimulatingsoftware.

Projectbasedlearnings:

1. SagcalculationsusingMATLAB
2. StringefficiencycalculationsusingMATLAB
3. LoadcurvecalculationsusingMATLAB
4. CreatingsmallmodelsofHydroelectricpowerplant
5. CreatingsmallmodelsofThermalpowerplant
6. CreatingsmallmodelsofNuclearpowerplant
7. CreatingsmallmodelsofSolarpowerplant
8. CreatingsmallmodelsofWindpowerplant
9. CreatingsmallmodelsofSolar-Thermalpowerplant
10. CreatingsmallmodelsofGas-Turbinepowerplant
11. CreatingsmallmodelsofBiogaspowerplant
12. CreatingsmallmodelsofBiomasspower plant
13. CreatingsmallmodelsofDieselpowerplant
14. CreatingsmallmodelsofGeothermalpowerplant
15. UseofGoogleearthsoftwaretodesignoftransmission line

TextBooks:

1. ACourseinPowerSystem-J.B.Gupta-S.K.Kataria&Son's
2. V.K.Mehta,"ElectricalPowerSystem",S.ChandPublications
3. R.K.Rajput,"AtextbookonPowerSystemEngineering",LaxmiPublications(P)Ltd

ReferenceBooks:

1. ElectricalPower-S.L.Uppal-KhannaPublication
2. EnergyTechnology-S.Rao,Dr.BBPanelkar-KhannaPublication
3. ACourseinPowerPlantEngineering-Arrora,Domkundwar-Dhanpatrai&Co.Publications
4. ACourseinElectricalPower-Soni,Gupta,Bhatanagar-Dhanpatrai&Co.Publications

SyllabusforUnitTest:

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

DesignofElectricalInstallations		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:03 Hours/Week	EndSemesterExamination:60Marks	Theory: 03
	ContinuousAssessment:40Marks	Total:03

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	FundamentalsofElectricalEngineering

CourseObjectives:

1. Tounderstandthebasicconceptsofregardingdesignofelectricalinstallations.
2. Toenablecandidatetounderstandserviceconnections,domesticcommercialandindustrialinstallations.
3. Tounderstandpracticalaspectsoftransformercommissioning&HT/LTdistributionlines.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Explainelectricalinstallationdesignmethodology.
2	Developanddesignofserviceconnections.
3	Developdesignofdomesticandcommercial installation.
4	Developanddesignofindustrialinstallation.
5	IllustratingtransformercommissioningandHT/LTdistributionlines.
6	Explaincontractandtendering.

UNIT–I	**ElectricalInstallationDesignMethodology**	**(06 Hours)**
	General rules of electrical installation design, Installed power loads - Characteristics and Powerloadingofaninstallation,ConnectiontotheMVutilitydistributionnetwork,ConnectiontotheLVutilitydistributionnetwork,LVDistribution,Protectionagainstelectricshocksandelectricalfires, Sizingandprotectionofconductors,EnergyEfficiencyinelectricaldistribution,Characteristicsofparticular sources and loads, Green and economical energy-Photovoltaic installation.	
UNIT- II	**DesignofServiceConnections**	**(06 Hours)**
	Concept of service connection. Types of service connection and there features. Methods of installation of service connections. Difference between overhead and underground service connection. List of materials and accessories for service connections.IE rules for service connections. Electrical panel designing. Estimationandcostingofserviceconnections.	
UNIT-III	**DesignofDomesticandCommercialInstallation**	**(06 Hours)**
	Concept of domestic/commercial installation. The general IS codes regarding internal wiring. Generalruleswhileexecutinginternalwiringof domestic/commercialinstallation.Computingthe conductor size and the procedure for determines the size. Define the circuits and sub circuits. Drawingthelayoutofwiring.Describingthepreparationoftheestimateandcostofmaterialsused for internal wiringof domestic/commercial buildings. Earthing in domestic/commercial installations. Sequence to be followed to prepare estimation. Compute simple problems. Study of domestic/commercial electricity bill.	
UNIT-IV	**DesignofIndustrialInstallation**	**(06 Hours)**
	Conceptofmotorwiringcircuitandsinglelinediagram.Guidelinesaboutpowerwiringandmotor wiring. Design considerations of electrical installation in industry/factory/ workshop. Calculation ofinputcurrentofthemotor.Selectionofsizeandratingofcable.Determinationofratingoffuse. Determinationofsizeofconductor.Sequencetobefollowedtoprepareestimation.Propermethod of earthing in industrial installation. Finding out estimation chart. IE rules for industrial wiring. Compute simple problems.	
UNIT-V	**TransformerCommissioning&HT/LTdistributionLines**	**(06 Hours)**

	Common Pre-commissioning Tests of Transformer, Buchholz Relay Test, **Insulation Resistance (IR), Break-Down Voltage (BDV) Test, Voltage Ratio Test, Winding Resistance Measurement Test, Marshalling Box Scheme Check, Temperature Indicator Test, Off-Circuit Tap Selector (OCTS).** DifferencebetweenHT/LTpower,HT/LTpowerrates-domestic,commercialandindustrialrates. ImpactofincreasingHTlines,VoltagelevelforHT/LTlines,LT/HTLinesandtransmissionlines, Lossreductionbyimproving ratioofHT/LT lineinElectricalDistributionSystem.	
UNIT-VI	**ContractsAndTendering**	**(06 Hours)**
	Contracts, Tenders: Concept of contract & tenders, Types of contracts & contractors, Types of tenders, Requirement of valid contract and good contractor, Tender notice, Procedure for submission and opening of tenders, Comparative statement for selection of contractors, Role of Electrical inspector in design and installation and duties, Electrical Liasoning services.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

1. StudyofdifferentIErules.
2. Drawingsheetonwiringdesignofdomesticinstallation.
3. Drawingsheetonwiringdesignofcommercialinstallation.
4. Drawingsheetonwiringdesignofindustrialinstallation.
5. Findingestimationchartforparticularinstallation.
6. Drawingsheetondesignofelectricalinstallation.
7. DrawingsheetondesignofHT/LTdistributionlines.
8. Experimenttounderstandcontracts/tenderprocedurebysampleexample.

ProjectBasedLearning

1. Study-visitandpreparereporttoonedomesticelectricalinstallationunderconstruction.
2. Study-visitandpreparereporttoonecommercialelectricalinstallationunderconstruction.
3. Study-visitandpreparereporttooneindustrialelectricalinstallationunderconstruction.
4. Prepareestimationchartofanyoneclassroomintheelectricaldepartment.
5. Visitandmakereportofrooftopsolarplant.
6. StudyofIErulesandmakeareportonit.
7. Drawingsinglelinediagramofelectricalmachinelabelectricalwiring.
8. StudyofBuchholzRelayofdistributiontransformeraroundcollegepremises.
9. Dotemperatureindicatortestofdistributiontransformeraroundcollegepremises.
10. Dovoltageratiotestofdistributiontransformeraroundcollegepremises.
11. PerformWindingResistanceMeasurementTestondistributiontransformeraroundcollegepremises.
12. PerformInsulationResistance(IR)Testondistributiontransformeraroundcollegepremises.
13. PerformBreak-DownVoltage(BDV)Testondistributiontransformeraroundcollegepremises.
14. Visit&studytheelectricsub-stationincollegepremises.
15. Studyofsupplyconnectionofyourelectricallab.
16. VisitnearbyHTlineandstudyitsoperation.
17. StudyTendernoticeappearedinlocalnewspaper&makereport.
18. MeetElectricalInspectorandunderstandhis/herduties.

TextBooks:

1. SurjitSingh-ElectricalEstimationandCosting",DhanpatRaiPublications.

ReferenceBooks:

1. S.L.Uppal-"ElectricalWiring,Estimation&Costing",KhannaPublishers
2. B.V.S.Rao-"Operation&MaintenanceofElectricalEquipments",(Vol2)MediaPromoters&PublishersPvt.Ltd.
3. Raina.K.B.andBhattacharyaS.K.,"ElectricalDesignEstimation&Costing",TataMcGrawHill,NewDelhi.
4. B.D.Arora-ElectricalWiringEstimation&Costing-NewHights,NewDelhi.

SyllabusforUnitTest:

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

ComputationalAlgorithms

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04 Hours/Week	EndSemesterExamination:60Marks	Theory:- 04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:- 01
	TermWork:25Marks&Oral:25marks	Total:- 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

Differentiationandintegrationofasinglerealvariable,ordinarydifferentialequations,FundamentalsofProgramming languages: MATLAB (Introduction), Linear Algebra, Flowchart and algorithm basics.

CourseObjectives:

- Toemphasizetheneedofcomputationaltechniquesandanalyzeerrorsinvolvedinthecomputation.
- Toprovidesoundknowledgeofvariousnumericalmethods.
- To apply various numerical methods to obtain solution of different types of equations such as transcendental, simultaneous, ODE etc. and also for interpolation, integration and differentiation.
- ToimpartskillstodevelopprogramsusingMATLAB

CourseOutcomes: Studentswillbeableto

1.	RecallMATLAB Basics,implementbasicprinciplesofnumericalmethodsandtypesoferrorsincomputationandtheircauses of occurrence.
2.	Identifyvarioustypesofequationsandapplyappropriatenumericalmethodtosolvedifferentequations.
3.	Applydifferentnumericalmethodsforinterpolation,differentiation.
4	ApplyandcomparevariousnumericalmethodstosolvefirstandsecondorderODEandnumericalintegration.
5	Applyandcomparevariousnumericalmethodstosolvelinearsimultaneousequations.
6	Identifyvariousstatisticalmethodsanddemonstrateapplicationsofalgorithminelectricalengineering.

UNIT-I	**MATLABBasics,NumericalMethodsandErrors:**	**(08Hours)**
	MATLAB: Data types, Operator, Variables, Control Statements, Loops, Access Control, **Arrays**: Introduction, one and two dimensional arrays. **Basicprincipleofnumericalmethods:**Floatingpointalgebrawithnormalizedfloatingpoint technique, Significant digits. **Errors:**Differenttypesoferrors,causesofoccurrenceandremediestominimizethem.Generalized error formula.	
UNIT- II	**SolutionofTranscendentalandpolynomialequationandCurveFitting:**	**(08Hours)**
	SolutionofTranscendentalandpolynomialequation: Bisection,Secant,Regula-Falsi, Chebyeshev and Newton-Raphson methods, Newton-Raphson method for two variables. **CurveFitting**usingleastsquareapproximation–Firstorderandsecondorder.	
UNIT-III	**InterpolationandNumericalDifferentiation:**	**(08Hours)**
	Interpolation: Difference operators, Introduction to interpolation- Newton's forward, backward interpolationformulae,Sterling'sandBessel'scentraldifferenceformulae,Newton'sdivided difference formula, Lagrange's interpolation. **Numerical Differentiation** using Newton's forward and backward interpolation formulae.	
UNIT-IV	**SolutionofOrdinaryDifferentialEquation(ODE)andNumericalIntegration:**	**(08Hours)**
	Solution of First Order Ordinary Differential Equation (ODE) using Taylor's series method, Euler's, Modified Euler's methods, Solution of Second order ODE using 4th order Runge-Kutta method.**NumericalIntegration:**TrapezoidalandSimpson'srulesasspecialcasesofNewtonCote's quadrature technique for single and double integrals.	
UNIT-V	**Solutionoflinearsimultaneousequation:**	**(08Hours)**
	Solutionofsimultaneousequation: Directmethods-GaussandGauss-Jordaneliminationmethods, concept of pivoting – partial and complete. Iterative methods – Jacobi and Gauss Seidel methods. **MatrixInversion**usingJordonmethodandEigenvaluesusingPowermethod.	
UNIT- VI	**StatisticalmethodsandApplicationofAlgorithmsinElectricalEngineering**	**(08Hours)**
	Statistical Methods: RandomSampling, Sample estimation,Hypothesis testing, Statisticalquality control and Monte Carlo methods. **Applications:**LoadForecastingmethods,ConditionMonitoring,BatteryManagementSystem,	

	ElectricalAutomation,Equationsolvingmethods(simplenumerical)for:LoadFlowstudies,Transient and Harmonic studies.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsin MATLABwithflowchartandresultsfrombelowlist.

1. SolutionofapolynomialequationusingBirge-Vietamethod.
2. SolutionofatranscendentalequationusingBisectionorRegula-Falsimethod.
3. SolutionoftwovariablenonlinearequationusingN-Rmethod.
4. ProgramforinterpolationusingNewton'sforwardorbackwardinterpolation.
5. ProgramforinterpolationusingLagrange'sorNewton'sDivideddifferenceinterpolation.
6. FirstordercurvefittingusingLeastsquareapproximation.
7. SolutionofsimultaneousequationusingGaussSeidelorJacobimethod.
8. SolutionofsimultaneousequationusingGausseliminationorJordonmethod.
9. TofindlargestEigenvalueusingPowermethod.
10. SolutionofNumericalIntegrationusingSimpson's(1/3)rdor(3/8)thrule.
11. SolutionoffirstorderODEusing4thorderRKmethodorModifiedEulermethod.

ProjectBasedLearning:

1. Developanalgorithmusinganyofthemethodforrealtimeapplications.
2. Writeareviewpaperforcomparativemethodbasedonanytypeofequationstoobtainsolution.
3. Developanarticleforanymethodusingmultipleoptionsinalgorithm(loops,functions)andanalyzethedifferenceinresult.
4. Identifyapplicationsinelectricalengineeringwhereerrorsareoccurredandfindsolutionhowtominimizetheerrors.
5. Developawebbasedapplication(staticordynamicmodel)forelectricalapplicationusingrelevantsoftware.

TextBooks:

1. M.K.Jain,S.R.K.Iyangar,R.K.Jain,"NumericalMethodsforScientificandEngineeringComputations",NewAge Publications.
2. T.VeerarajanandT.Ramchandran,"NumericalMethodswithProgramsinCandC++",TataMcGrawHillPublication.
3. P.P.Gupta&G.SMalik,"CalculusofFiniteDifferenceandNumericalAnalysis",KrishnaPrakashanMediaLtd,Meerut
4. Dr.B.S.Grewal,"NumericalMethodsinEngineering&Sciences",KhannaPublishers.
5. E.Balagurusamy,"NumericalMethods",TataMcGrawHillPublication.

ReferenceBooks:

1. J.B.Scarborough,"NumericalMathematicalAnalysis",Oxford&IBH,NewDelhi.
2. StevenChapra,RaymondP.Canale,"NumericalMethodsforEngineers",TataMcGrawHillPublication.
3. S.S.Sastry,"IntroductorymethodsofNumerical Analysis",PHILearningPrivateLtd.
4. P.Thangaraj,"ComputerorientedNumericalMethods",PHILearningPrivateLtd.

SyllabusforUnitTest:

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

IndustryTaughtCourse-IOperatingSystems

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04 Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks,Oral:25Marks	Total:05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	ComputerSystem,ApplicationsofComputersandComputeroperation's.

CourseObjectives:

	To learn the basic structure and operations of a computer. UnderstandthememoryandI/Oorganizationandrecenttrends

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Discusstheoperatingsystemandtheirprinciples
2	Analyzetheprocessmanagementsystem
3	Elaboratethememorymanagementsystem
4	AnalyzetheI/Oandfilemanagementsystem
5	Analyzetherecenttrendsandcomparethefuturetechnologies
6	Examinethevariousapplicationsofcomputersystems.

UNIT–I	**OPERATINGSYSTEM**	**(08Hours)**
	Computer System functions. The Evolution of Operating Systems, Developments Leading to ModernOperatingSystems,VirtualMachinesEvolutionofOperatingSystem.-ComputerSystem OrganizationOperatingSystemStructureandOperations-SystemCalls,SystemPrograms,OS GenerationandSystemBoot.	
UNIT- II	**PROCESSANDTHREADMANAGEMENT**	**(08Hours)**
	Processes-Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; Threads- Overview, Multicore Programming, Multithreading Models; Thread and SMP Management. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors.	
UNIT-III	**MEMORYMANAGEMENT**	**(08Hours)**
	Memory Management Requirements, Swapping, continuous memory allocation Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation.VirtualMemory:HardwareandControlStructures,OperatingSystemSoftware, LinuxMemoryManagement,WindowsMemoryManagement,AndroidMemoryManagement.	
UNIT-IV	**INPUT/OUTPUTANDFILEMANAGEMENT**	**(08 Hours)**
	I/OManagementandDiskScheduling:I/ODevices,Organization oftheI/OFunction,Operating SystemDesignIssues,I/OBuffering,DiskScheduling,DiskCache,LinuxI/O.FileManagement: Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, Linux Virtual File System, Android File Management.	
UNIT-V	**TRENDSINOPERATINGSYSTEMS**	**(08Hours)**
	LinuxKernelModuleProgramming,EmbeddedOperatingSystems:CharacteristicsofEmbedded Systems, Embedded Linux, and Application specific OS. Basic services of NACH Operating System. Introduction to Service Oriented Operating System (SOOS), Introduction to Ubuntu EDGE OS, etc.	
UNIT-VI	**LINUXSYSTEMANDCASESTUDY**	**(08Hours)**
	BasicConceptsofLINUX,MultifunctionServer,Virtualization-Xen,VMwarewithLinuxHost, Androidoperatingsystem –Features,characteristics,Basicbuildingblocks,Architecture,System services. CaseStudy:DOSandWindowsOperatingSystem,UnixOperatingSystem	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsandnotlimitedto

1. Processcontrolsystemcalls
2. ApplyBanker'salgorithm
3. InterprocesscommunicationinLinux
4. LinuxKernelconfiguration,compilationandrebootingfromthenewlycompiledkernel.Requirements
5. Kernelspaceprogramming
6. ImplementingaCPUschedulingpolicyinaLinux OS.
7. Implementingamemorymanagementpolicyina Linux OS.
8. ImplementingafilesysteminaLinuxOS.
9. ApplydiskSchedulingalgorithms

ProjectBasedLearning

1)Todevelopseveralsystemcallstoenableuserprogramstointerfacewiththefilesystem.

2)Functioningthreadingsystem-schedulingalgorithm,interrupthandling.

3)Toenablethememorysystembyenablingvirtualmemory,includingaddingpagingsupport,stackgrowth,memorymappedfile support, and protects user level pages while in use by the kernel.

TextBooks:

1. WilliamStallings,OperatingSystem:InternalsandDesignPrinciples,PrenticeHall,8thEdition,2014.
2. AbrahamSilberschatz,PeterBaerGalvinandGregGagne,OperatingSystemConcepts,JohnWiley&Sons,Inc.,9th Edition,2012.
3. MauriceJ.Bach,"DesignofUNIXOperatingSystem",PHI

ReferenceBooks:

1. DhananjayMDhamdhere,'OperatingSystems-AConceptBasedapproach',TataMcGraw,Hillpublication
2. AbrahamSilberschatz,PeterB.Galvin&GregeGagne(Wiley))'.OperatingSystemConcepts'
3. SumitabhaDas,'UnixConceptsandApplications,TataMcGrawHill
4. AchyutS.Godbole,'OperatingSystemwithcasestudiesinUnix,NetwareandWindowsNT'TataMcGrawHill
5. KarimYoghmour'EmbeddedAndroid',O'ReillyPublication

SyllabusforUnitTest:

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

ApplicationSoftwaresinElectricalEngineering

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Practical:02Hours/Week	TermWork:25Marks	Total:01

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

Basic ElectricMachines,MagneticTheory,IntroductiontoElectricalPowersystem,StructureofElectricalpower system, Sources of Electrical Energy, Elements of Power system

CourseObjectives:

- Students will get well familiar with importance of electrical design, different design techniques and application of tools for electrical design and analysis.

CourseOutcomes: Studentswillbeableto

1.	Relatethebasicknowledgeofelectricalsystemwithelectricaldesign
2.	Understandtheimportanceofsoftwaretoolandexploreits GUI
3.	Applytheknowledgeoftoolbarforunderstandingthedesignconcept
4	Identifyvariouselectricalapplicationsaspersoftwaretools
5	Discussthemethodsofsoftwaresimulationinelectricalengineering
6	Applytheknowledgefordesignandanalysisofelectrical machines

UNIT-I	**IntroductiontoElectricalDesign:**
	Introduction to Electrical System for Electrical Design and analysis, Application of Electrical Design, PurposeofElectricalDesign,BasicDesignphilosophy,ImportanceofResultsfromdesigntools,design optimization, Standard Rules for Electrical Design.
UNIT- II	**IntroductiontoETAPSoftware:**
	IntroductiontoETAPsoftware,ImportanceofETAPforSystemdesign,HistoryofETAP,Keyfeatures & Benefits of ETAP, Codes & Standards, Working with ETAP software- Starting ETAP software, Creating a new project, Changing the Project standard, File Management, Exploring GUI.
UNIT-III	**ToolbarandLibraryforETAP:**
	ToolbarDescription-ProjectToolbar,ThemeToolbar,SystemToolbar,ModeToolbar,Base& RevisionToolbar,InsertingCircuitElements-LibraryforCircuitElements,SystemElementsand Components,Element Classification - AC Elements , DC Elements , AC-DC Elements , Instrumentation Elements , Component Editor
UNIT-IV	**IntroductiontoANSYSMaxwellsoftware:**
	Introduction to ANSYS Maxwell software and general applications, Applications of software in electricalengineering,Maxwellsolvers-electricandmagneticsolution,GUI,RMXprttool,Introduction to 2D simulation, Introduction to 3D simulation.
UNIT-V	**ANSYSMaxwellsoftwaresimulation:**
	Finite element method, Selection of Geometry and solver types, Defining analysis plane, selection of solver,modelunits,Exploiting magnetic/excitationsymmetryinmodel,Assigningmaterialproperties, Assigningexcitationandboundaryconditions,Modelverification.
UNIT- VI	**ElectricMachinesimulation:**
	NeedformachinesimulationApplicationsofANYSYMaxwellsoftwareformachinesimulation, Designandanalysisofanyoneelectricmachineusing RMXprttool,Maxwell2Dsimulation,Maxwell 3Dsimulation,Discussiononsimulationsresults.

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments inETAPandANSYSwithflowchartandresultsfrombelow list.

1. PrepareathelistoftoolsusedforElectricalDesignandAnalysis
2. Prepareanewprojectandchangetheprojectstandardusing ETAPsoftware
3. Studyofsystemtoolbarsindetailswithitsapplicationin ETAPsoftware
4. StudyofsystemelementsandcomponentsinETAPsoftware
5. StudyofLibraryforETAPsoftwareanditsapplications

6. StudythecomponentseditoranditsworkinginETAPsoftware
7. DesignandanalysisofanyoneconventionalelectricalmotorusingRMXprttool.
8. Studyof2DmodelforanyoneconventionalelectricalmotorusingANSYSMaxwellsoftware.
9. Studyof3DmodelforanyoneconventionalelectricalmotorusingANSYSMaxwellsoftware
10. DesignandanalysisofanyonespecialpurposemachineusingRMXprttool.
11. Studyof2DmodelforanyonespecialpurposemachineusingANSYSMaxwellsoftware.
12. Studyof3DmodelforanyonespecialpurposemachineusingANSYSMaxwellsoftware.

ProjectbasedLearning:

1. ObtainandprepareSingleLineDiagramfromanyrealtimeprojectinETAPsoftwarewithoutanyerrors.
2. DevelopasubstationSLDofanyvoltagelevelbygivingsuitableinputparameters
3. Generatereportsthroughaboveanalysisandgivepresentationontheresultsobtained.
4. DesigningInductionmotor/BLDCmotor/SwitchedReluctancemotorasperspecificationsusingRMXprt.
5. 2DmodelofassignedmachinethroughANSYSMaxwellsoftware.
6. Developanarticlebasedonanycontentrelatedto ETAPsoftwaregetitpublishedinconference/technicaljournal,etc.
7. Developanarticlebasedonanycontentrelatedto ANSYSsoftwaregetitpublishedinconference/technicaljournal,etc.

TextBooks:

1. HemchandraMadhusudanShertukde,"PowerSystemsAnalysisIllustratedwithMATLABandETAP",CRCPress,Taylor and Francis Group
2. VivekRavindran,PrajithKumar,SumitTomar,"Modeling,SimulationandOptimizationofaPowerSystem Network:A case study using ETAP software", LAP Lambert Academic Publishing.
3. JohnE.Matsson,"AnintroductiontoANSYSFluent2021",SDCPublications.
4. Huei-HuangLee,"FiniteElementSimulationswithANSYSWorkbench2021Theory,applicationsandcasestudies", SDC Publication.

ReferenceBooks:

1. T.Stolarski,Y.Nakasone,S.Yoshimoto"EngineeringanalysiswithANSYSsoftware",BH Publication.
2. SaeedMoaveni,"FiniteElementAnalysisTheoryandapplicationwithANSYS",Thirdedition,Pearsonpublication.
3. Dr.MariusRosu,Dr.PingZhou,Dr.DingshengLin,"MultiphysicsSimulationby DesignforElectricalMachines, Power electronics and Drives", IEEE Press Wiley.

VocationalCourse-IAutoCADElectrical

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Practical:02Hours/Week	TermWork:25Marks&Oral:25Marks	Total:01

CoursePre-requisites:

TheStudentsshouldhavebasicknowledge of

1.	AworkingknowledgeoftheAutoCADsoftwareandelectricalterminology

CourseObjectives:

- NavigatetheAutoCADElectricaluserinterface.
- UsethefundamentalfeaturesofAutoCADElectrical.
- Build intelligent ladder diagrams and panel layouts.
- Create, view, and edittheprojectsettingsand properties.
- Extractdatafromdrawingsinto reportsformattedtomatchusers' standards.
- InsertandeditparametricPLCmodules,nonparametricPLCmodules,andstand-alone PLC I/O points.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Illustratethebasicsofelectricaldrawingsandlistthecommonsymbolsinelectricaldrawings.
2	Explainthebasicsof schematics.
3	Constructthecircuitandmarkthecables.
4	Explainthepanellayoutandidentifythecomponents.
5	ExplainthePLC,itslayout,PLCparameterselectionandconnectionofwiresfromsourcetoequipment.
6	Compareandexaminethegeneratedreport.

UNIT– I	**Basicsofelectricaldrawings**	
	Need of Drawings, Electrical Drawings, Common Symbols in Electrical Drawings, Wire and its Types,Labeling. DesignEnvironment, BasicWorkflow,Project Manager, Project Drawing List, Moving Through a Project, Copy Projects, **GUI.**	
UNIT-II	**Schematics**	
	Single wires/components, referencing, Ladders, Wire Type, Wire Numbers, PLC I/O wire numbers, 3-Phase Circuits, Source and Destination Signal Arrows, Multi Wire 3-Phase Circuits, Point-2-Point Connectors.	
UNIT-III	**CircuitandCables**	
	Cable markers, Fan In/Out, insert saved circuits, save circuits to ICON menu, circuit clipboard, circuit builder, copy component, align, delete componentand attribute editing commands.3 D modelofelectricalassembly.Drawingsofelectricalmachineshalfsectionalendandhalfsectional elevation.	
UNIT-IV	**Panels**	
	PanelLayout,FootPrints,FootprintsfromSchematiclist,Footprintsfromiconmenu,Dinrails, Balloons, Wire Annotations, Create Assembly, Editing & Modifying Footprints. Creating Own Footprint, Placing a Terminal. Terminal Editor	
UNIT-V	**PLC**	
	Generate PLC Layout Modules, PLC parametric selection, Module layout, Insert PLC modules, Edit PLC module, PLC Database File. Point to Point Wiring Tools, Introduction to Connector Diagrams, Inserting Connectors, Editing & Modifying Connectors, Link components by dashed lines, Grouping Wires	
UNIT-VI	**Reports**	
	GenerateReports,Typesofschematicreports,Generateaschematicreport,Typesofpanelreports, Generate a panel report, Run automatic reports, Automatic report generation, Audit:MissingCatalog,ElectricalAudit,SignalError/List,DrawingAudit Import/Export: To Spreadsheet. From Spreadsheet	

TermWork:

Thetermworkshallconsistofrecordofminimumeight(2basedonschematics,2basedon3Dmodelofelectricalassembly,2 based on panel layout and 2 based on PLC Circuit)sheets.

1. Tocreateaschematicfor3phasemotorstarters
2. Tocreateaschematicdrawingofanycircuitofdcmachinesexperiment
3. TocreateaschematicdrawingofLoadtestonaLinearInductionMotor
4. Tocreateaschematicdrawingof LoadtestonaACSeriesmotor.
5. ToCreateschematicofthegivencircuit.Designthepanelfortheuserandthengeneratethereportforthecomponents.
6. Todrawthehalfsectionalendandhalfsectionalelevationofsquirrelcagemotor
7. Todrawthehalfsectionalendandhalfsectionalelevationof DCgenerator
8. Todrawthedetaileddrawingofeach partofsinglephasetransformer
9. Todrawthe3-phase,doublelayerlapwindingwithfullpitchandchordedcoils
10. Tocreateapanellayoutof3phasemotor starters
11. TocreateapanellayoutofLoadtestonaLinearInductionMotor
12. TocreateapanellayoutofLoadtestonaACSeriesmotor.
13. CreatethePLCcircuitofthegivenfigure

TextBook:

1. AUTOCADELECTRICAL2016BLACKBOOKBy*GauravVermaCAD/CAM/CAEExpertMattWeberCAD/CAE Expert (CADCAMCAE Works, Georgia)*
2. AutoCADElectrical2019:FundamentalswithNFPAStandards:AutodeskAuthorizedPublisher
3. AutoCADElectrical2016forElectricalControlDesigners,Prof.ShamTickooPurdueUniversity
4. GettingStartedAutoCAD®Electrical2005
5. AutoCADElectrical2012User'sGuide

BharatiVidyapeethDeemedtobeUniversity,Pune
Faculty of Engineering & Technology
Programme:B.Tech(ElectricalEngineering)Sem–IV(2021Course)

SpecialPurposeMachines		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory: 04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Oral:25Marks	Total:05

CoursePre-requisites:

TheStudentsshouldhavebasicknowledge of

1.	ElectricalMachines(DCandAC)andPowerElectronics.

CourseObjectives:

	Thiscourseaimsat understanding theconstruction, workingprinciple,control,performanceandapplicationsofspecial purpose machines as an extension to the study of basic electrical machines.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Explainconstruction,principalofoperationandapplicationsofspecialtypesofDC/ACmachines.
2	Explaintypes,characteristicsandcontrolmethodsofservomotors.
3	Describethetypes,characteristicsofsteppermotorandselectthemotorasperapplications.
4	Explaintypes,characteristics,applicationsandcontrolmethodsofReluctancemotor.
5	Describeconstruction,principalofoperationandapplicationsofBrushlessDCMotor.
6	Describeconstruction,principalofoperationandapplicationsofPermanentMagnetSynchronousMotor.

UNIT– I	**SpecialTypesofDC/ACMachines**	**(08 Hours)**
	Construction,operatingprinciple,characteristicsandapplicationsof: Inductiongenerator,RosenbergGenerator,threewiregenerator,ElectricWeldingGenerator,Printed CircuitBoardMotor,Universalmotor,Linearinductionmotor,DYNAMotors,phaseadvancer,Rotary Amplifiers, Series Boosters.	
UNIT-II	**ControlMotors(ServoMotors)**	**(08 Hours)**
	Servo Mechanism, fundamental characteristics, types – **DCServo Motors:** field controlled, armature controlled and permanent magnet armature-controlled dc motor with schematic diagrams. **ACServoMotors:**Construction,productionoftorque,torquespeedcharacteristics,types,methodsof control and applications.	
UNIT-III	**StepperMotor**	**(08 Hours)**
	Constructional features – Principle of operation. Types of stepper motors-Variable reluctance motor, Hybrid motor, Permanent magnetmotor. Single and multistack configurations. Theory of torque production,Torqueequations–Modesofexcitation.Characteristicsofsteppermotor-Staticand dynamics characteristics. Concepts of lead angles, micro stepping, Drive circuits, Applications and selection of motor.	
UNIT-IV	**ReluctanceMotors**	**(08 Hours)**
	Synchronous Reluctance Motor: Constructional features, Operating principle, Voltage and Torque Equations, Phasor diagram, performance characteristics and Applications. **Switched ReluctanceMotor:** Constructional features, Principle of operation, Torque production, Steady state performance prediction, Analytical method. Power Converters and their controllers. Methods of Rotor position sensing, Sensor less operation, Characteristics and Closed loop control. Applications. Comparison between VR Stepper Motor and SR Motor	
UNIT-V	**BrushlessDCMotor**	**(08 Hours)**
	Basicconcepts,Magneticmaterials. **Brushless DC Motor:** Construction, Principal of operation, Types, EMF and torque equations – Commutation - Power Converter Circuits and their controllers, Comparison with DC motor, Applications.	
UNIT-VI	**PermanentMagnetSynchronousMotor**	**(08 Hours)**

	Sinewave Motor/Permanent Magnet Synchronous Motors (PMSM): Ideal and practical motor.Construction,Principleofoperation,EMFandTorque equations,ArmatureMMF,Synchronous Reactance,Phasordiagram–Torque/speedcharacteristics-Powercontrollers-ConverterVolt-ampere requirements– Applications.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

1. LoadtestonaUniversalMotoranddeterminetheperformancewithdc/acsupplyvoltages.
2. LaboratorydemonstrationofInductionGenerator.
3. LoadtestonaLinearInductionMotoranddeterminethespeedthrustcharacteristic.
4. LaboratorydemonstrationofAC/DCServomotor.
5. ExperimentalanalysisofStepperMotorDrive.
6. Loadtestinordertodeterminetheperformancecharacteristicsofthe ReluctanceMotor.
7. Todeterminethed-axisandq-axissynchronousreactanceoftheReluctanceMotor.
8. Experimentalanalysis/simulationofSwitchedReluctanceMotorDrive.
9. Experimentalanalysis/simulationofPermanentMagnetBLDCMotorDrive
10. Experimentalanalysis/simulationofPMSMmotordrive.
11. LoadCharacteristicsofBrushlessDCMotor.
12. Studyofdifferentsoftware'sfordesign andanalysisofspecialpurposemachines.
13. Theoreticaldesignofanyonetypeofspecialpurposemachine.

Projectbasedlearning: Studentshalldemonstrateminimumoneconceptbasedonsyllabustopic.

1. Developmentofprototypeofanyonetypeofspecialpurposemachine.
2. Practicalstudyofanyonetypeofspecialpurposemachine.
3. Theoreticaldesign/softwaresimulationofanyonetypeofspecialpurposemachine.

TextBooks:

1. K.Venkataratnam,'SpecialElectricalMachines',UniversitiesPress(India)PrivateLimited,2008.
2. T.Kenjo,'SteppingMotorsandTheirMicroprocessorControls',ClarendonPressLondon,1984.
3. D.P.KothariandIJNagarath:'ElectricMachines,'ThirdEdn,TataMcGraw-HillPub.,2004.
4. V.K.Mehta,PrinciplesofElectricalMachines,SChand Publication.
5. B.L.Theraja,A.K.Theraja.'ATextbookofelectricaltechnology-AC&DCMachines'Volume-II,S.Chandpublication.
6. BhimbhraP.S.,'ElectricalMachineandPowerElectronics'Tata-McGrawHillPublication.
7. AshfaqHusain,"ElectricMachines",DhanpatRaiandco.publications.
8. PrithwirajPurkait,IndrayudhBandyopadhyay"ElectricalMachines"OxfordUniversityPress
9. CharlesI.Hubert,"ElectricalMachine,Theory,Operation,Applications,AdjustmentsandControl"LowPriceEdition, Pearson Education.

ReferenceBooks:

1. R.Krishnan,'SwitchedReluctanceMotorDrives –Modeling,Simulation,Analysis,DesignandApplication',CRCPress, New York, 2001.
2. T.J.E.Miller,'BrushlessPermanentMagnetandReluctanceMotorDrives',ClarendonPress,Oxford,1989.
3. P.P.Acarnley,'SteppingMotors–AGuidetoMotorTheoryandPractice',PeterPerengrinusLondon,1982.
4. T.KenjoandS.Nagamori,'PermanentMagnetandBrushlessDCMotors',ClarendonPress,London,1988.
5. E.G.Janardanan,'Specialelectricalmachines',PHIlearningPrivateLimited,Delhi,2014.
6. OgataK.,'ModemcontrolEngineering',PrenticeHall.
7. A.E.Fitzgerald,CharlesKingsley,StephenUmans,'ElectricMachinery',TataMcGrawHill Publication
8. P.C.Sen,"PrinciplesofElectricalMachinesandPowerElectronics",JohnWilley&Sons
9. IonBoldea,'LinearElectricMachines,DrivesandMaglevs',CRCPress
10. DauneC.Hanselman,"BrushlessPermanentMagnetMotorDesign"McGrawHill,Inc.

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

Network&Synthesis

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:03 Hours/Week	EndSemesterExamination:60Marks	Theory:- 04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:- 01
Tutorial:01Hours/Week	TermWork:25 Marks	Total:- 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

Terminology of electrical networks,series and parallelcombinations ofresistance,Laplacetransforms ,linear differential equations.

CourseObjectives:

- TodevelopthestrongfoundationforElectricalNetworks.
- TodevelopanalyticalqualitiesinElectricalcircuitsbyapplicationofvarioustheorems.
- TounderstandthebehaviorofcircuitsbyanalyzingthetransientresponseusingclassicalmethodsandLaplaceTransform approach.
- ToapplyknowledgeoflawsandNetworktheoryforanalysisof2-portnetworksanddesignofothercircuitslikefilters.

CourseOutcomes: Studentswillbeableto

1.	Calculatecurrent/voltageinelectricalcircuitsusingsimplificationtechniques,Mesh,Nodalanalysis.
2.	Calculatecurrent/voltageinelectricalcircuitsusingNetworktheoremsandunderstandthegraphtheory.
3.	AnalyzetheresponseofRLCcircuitwithelectricalsupplyintransientandsteadstate.
4	ApplyLaplacetransformtoanalyzebehaviorofanelectricalcircuit.
5	Deriveformulaandsolvenumericaloftwoportnetworkand Designoffilters.
6	Applyknowledge ofnetwork theoryto findtransferfunction, poles andzeroes location toperformstabilityanalysis and parallel resonance.

UNIT-I	**BasicsofNetworkwithtypes,Mesh&NodalAnalysis**	**(08Hours)**
	Lumped and Distributed, Linear and Nonlinear, Bilateral and Unilateral, Time-variant and Time invariant. Independent and Dependent (controlled) voltage and current sources. Concept of voltage and current divider, Source transformation and shifting. Network Equations: Network equations on LoopbasisandNodebasis,choicebetweenLoopanalysisandNodalanalysis.Conceptofsupernode andsupermesh,mutualinductance,Dotconventionforcoupledcircuits,Conceptofdualityanddual networks.	
UNIT- II	**NetworkTheoremsandGraphTheory:**	**(08Hours)**
	NetworkTheorems: Superposition,Thevenin's,Norton,MaximumPowerTransferTheorem, Reciprocity, Millman's theorems applied to electrical networks with all types of sources. **GraphTheory:**Tree,Co-tree,Incidencematrix,F-cutestMatrix,TiesetBMatrix	
UNIT-III	**TransientsinRLCcircuit:**	**(08Hours)**
	Solutions of differential equations and network equations using classical method for R-L, R-C and R-L-CcircuitswithDCandsinusoidalexcitation(under-damped,over-dampedandcriticallydamped conditions with derivation), Initial and Final Condition (series and parallel).	
UNIT-IV	**LaplaceTransformanditsApplications:**	**(08Hours)**
	Basic Properties of Laplace Transform, Laplace Transform of Basic R, L and C components, Solutions of differential equations and network equations using Laplace transform method for RL, R-CandR-L-Ccircuits(seriesandparallel),InverseLaplacetransforms,transformednetworkswith initial conditions. Analysis of electrical circuits with applications of step, pulse, impulse & ramp functions,shifted&singularfunctionstheconvolutionintegral, applicationofinitialandfinalvalue theorem,ApplicationofLaplacetransformationtechniqueinelectriccircuitanalysis.	
UNIT-V	**TwoportnetworkandFilters:**	**(08Hours)**
	TwoPortNetwork: Shortcircuitadmittance,opencircuitimpedance,Hybridparametersand transmission parameters, Interrelations between parameters. **Filters:**Introductiontopassivefilters,lowpassfilters,highpassfiltersandm-derivedLPFandHPF filters and design.	
UNIT- VI	**NetworkFunctions:**	**(08Hours)**
	PolesandZeros:Terminalpairsorports,networkfunctionsfortheoneportandtwoports,the	

	calculationofnetworkfunctions,generalnetworks.Polesandzerosofnetworkfunctions,Restrictions onpolesandzeroslocationsfortransferfunctionsanddrivingpointfunction,Time–domainbehavior from the pole and zero plot. Stability of active networks. Parallel Resonance, Resonance frequency, Quality factor, Current and resonance.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments:

1. VerificationofSuperpositiontheoreminA.C.circuits.
2. VerificationofThevenin'stheoreminA.C.circuits.
3. VerificationofReciprocitytheoreminA.C.circuits.
4. VerificationofMillman'stheorem.
5. VerificationofMaximumPowerTransfertheoreminA.C.circuits.
6. DeterminationoftimeresponseofR-CcircuittoastepD.C.voltageinput.(Charging anddischargingofacapacitorthrough a resistor).
7. DeterminationoftimeresponseofR-LcircuittoastepD.C.voltageinput.(Riseanddecayofcurrentinaninductive circuit).
8. DeterminationoftimeresponseofR-L-CseriescircuittoastepD.C.voltageinput.
9. DeterminationofparameterofTwoPortNetwork.
10. Determinationofcurrentunderparallel Resonancecondition.
11. DeterminationofResonance,BandwidthandQfactorofR-L-Cseriescircuit.

Projectbasedlearning:

1. Prepareahardwaremodelbasedonanyofthenetworktheoremandcalculatecurrentflowingthroughtheload.
2. Prepareasimulationmodelfortheabovehardwaremodelinanysoftwareandcomparetheresultswithhardwaremodel.
3. Developanarticlebasedonhardwareandsoftwaremodelandgetitpublishedinconference/technicaljournal,etc.
4. WiththehelpofCROperformtransientanalysisofvoltageandcurrentforanyofthecircuit.

TextBooks:

1. NetworkAnalysisThirdEditionbyM.E.VanValkenburg,PrenticeHallofIndiaPrivateLimited.
2. NetworkAnalysis&SynthesisbyG.K.Mittal,KhannaPublication.
3. NetworkAnalysisandSynthesisbyRavishRSingh,McGrawHill.
4. IntroductiontoElectricCircuitsbyAlexander&Sadiku,McGrawHill.
5. IntroductiontoElectricCircuitsbyS.Charkarboorty,DhanpatRai&Co.
6. FundamentalsofElectricalNetworksbyB.R.Gupta&VandanaSinghal-S.ChandPublications
7. ElectricalCircuitAnalysis2ndEditionbyP.RameshBabu,ScitechPublicationIndiaPvt.Ltd.

ReferenceBooks:

1. NetworkAnalysisbyCramer,McGrawHillPublication.
2. EngineeringCircuitAnalysisbyWilliamH.Hayt,Jr.JackE.Kemmerly,McGrawHillPublication.
3. Schaum'sOutlineofElectricCircuits,McGraw-HillEducation;7edition

SyllabusforUnitTest:

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

PowerElectronics		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory: 04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Practical:25marks	Total:05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	FundamentalsofElectronicsEngineeringandFundamentalsofElectricalEngineering

CourseObjectives:

Tointroducebasicknowledgeofelectronicsdevicesusedforcontrolofpower.

Todescribecharacteristicsandapplicationcircuitsof SCRandotherpowerdevices.

CourseOutcomes: Afterlearningthiscoursethestudentswillbeable to

1.	ToUnderstandtheworkingandapplicationofPowersemiconductordevices
2.	ToUnderstandtheworkingandapplicationofACtoDCconverters
3.	ToUnderstandtheworkingandapplicationofACvoltagecontrollers
4	ToevaluateDCtoDCconverters
5.	TostudyDCtoACinverters
6.	ToundertandtheapplicationsofpowerElectronics

UNIT-I	Powersemiconductordevices	**(08Hours)**
	Classificationofpowersemiconductordevices Uncontrolled turn-on and turn-off (Diode), Controlled turn-on and uncontrolled turn-off (SCR, TRIAC),Controlledturn-onandcontrolledturn-off(BJT,MOSFET,Double-diffusedMOSFET (DMOS), V shaped gate MOSFET (VMOS), CoolMOS, CoolSic (silicon carbide) MOSFET, CoolGan transistor (Gallium Nitride e-mode HEMTs), Insulated-gate bipolar transistor IGBT, static induction transistor SIT, GTO, Integrated gate-commutated thyristor IGCT, MOS-controlled thyristor MCT, static induction thyristor SITH), Continuous gate signal requirement (BJT, MOSFET, COOLMOS, IGBT, SIT), Diamond wafer technologies for semiconductor device applications, synthetic diamond semiconductor technology. Synthetic chemical-vapor-deposition (CVD) diamond semiconductor technology, Single crystal diamond wafers for high power electronics **ThyristorPowerDevices** SCR- staticand dynamiccharacteristics, specifications, two transistor analogy,gate characteristics, triggering circuits, protection of SCR, SITH Protectionofpowercircuitfrom -overvoltage,overcurrent&temperaturerise(thermal) Design of Snubber circuit. **TransistorPowerDevices** MOSFET,IGBT,MCT,COOLMOS,SIT,Construction,Characteristics,Specifications,Safe Operating Areas, protection, switching action and their control circuit requirement, comparison and area of application of these devices, Diagram and working of Switched Mode Power supply (SMPS) and Uninterrupted Power Supply (UPS)	
UNIT- II	**ACtoDCConvertors(Singlephaseandthreephase)**	**(08Hours)**
	Single phase convertor, three phase semi controlled and fully controlled bridges with R, RL and RLEloads,derivation of averageand RMS outputvoltageand current,rectification and inversion mode of operation, concept ofoverlap angle and associated voltage drop calculation,dual convertorand selection of transformer and semiconductor devices for convertors. Total Harmonic Distortion (THD).	
UNIT-III	**ACVoltageControllers**	**(08Hours)**
	DIAC, TRIAC - construction, characteristics, four mode operation, specifications, triggering of TRIACusingDIAC,ACvoltageregulatorprinciple,singlephaseandthreephaseanalysiswithR	

	andRLLoad,Harmonicsandripplefactor,Applicationsoftwostage,threestageandmultistage voltage controllers, derivation of average and RMS output voltage and current	
UNIT-IV	**DCtoDC Convertors**	**(08Hours)**
	Principle of operation of chopper, classification on the basis of operating quadrants control techniques,CLC,TRC,PWMandFMtechniques,analysisofstepupchoppersandnumerical withRLEload,areaofapplication,necessityofinputfilter,derivationofaverageandRMS output voltage and current	
UNIT-V	**DCtoACInverters**	**(08Hours)**
	Singlephaseandthreephaseinvertersprincipleofoperation,VSIand CSI inverters,applications, operating frequency range. PWM inverters: single pulse, multi-pulse and sinusoidal pulse modulation, PWM techniques for voltage control and harmonic elimination.	
UNIT-VI	**ApplicationsofPowerElectronics**	**(08Hours)**
	Powerelectronicsforrenewableenergysystems.,energystoragesystems,smartcities,smartgrids, powersystems:FACTS,HVDCsystems,etc.,transportapplications(electricvehicles,trains, aircrafts, ships, etc.).,industrial applications.,medicalapplications., inmilitaryapplications. telecommunicationapplications.,energyharvestingsystems.,consumableapplications.home appliances.Wearabledevices	

TermWork:

Thetermworkshallconsistofminimumeightexperiments.

1. tostudysoftwarebaseddesignofconvertercircuits
2. V-ICharacteristicofSCR,DIAC&TRIAC
3. V-IcharacteristicofpowersemiconductordevicesGTO,MOSFET,IGBT
4. 1PhasehalfControlled&Fullcontrolledconverter(R&RLLoad)
5. 3phaseconverter(R,RL,RLE Load)
6. StepdownChoppercircuit(RCtechnique)
7. 3phaseVoltageSourcetransistorizedinverter
8. FiringcircuitfOr3phaseconverter
9. 1phaseor3phaseACvoltageregulator
10. 3phaseAC–DCconverterwithRLELoad
11. 1phasePWMbridge inverter

Projectbasedlearning:

1. CommutationcircuitofSCR
2. DesignofSnubberCircuit
3. CollectionofdatasheetsofPower Devices
4. Matlabbasedexperimentsonpower electronics
5. casestudyofaindustrymanufacturingcovertors
6. todesignandbuildarectifiercircuitinthelaboratory
7. todesignandbuildaactoDCconvertercircuitinthe laboratory
8. todesignandbuildaDCtoDCconvertercircuitinthelaboratory
9. todesignandbuildaDctoACinvertercircuitinthelaboratory
10. todesignandbuildacircuitforapplicationinsolarenergyinthelaboratory
11. todesignandbuildacircuitforapplicationinwindenergyinthelaboratory
12. todesignandbuildacircuitforapplicationinenergystoragesysteminthelaboratory

ReferenceBooks:

1. VedamSubraManyam-“PowerElectronics”-NewAgeinternational,NewDelhi
2. Dubey,Donald,Joshi,Sinha-“ThyristerisedPowerController”-WileyEasternNewDelhi
3. M.DSingh&KBKhandchandani,“PowerElectronics”-TataMcGrawhill
4. JaiPAgarwal-“PowerElectronics,Systemstheory&design”LPEPearsonEducation
5. LUmanand-“PowerElectronic,Essentials&Applications”-Wileypublication
6. Randall,Shaffer-“FundamentalofPowerElectronicswithMatlab”
7. J.Michale,Jacob-“PowerElectronicsPrinciples&Applications”
8. VKMehta–“PrinciplesofElectronics”–S.ChandPublications

9. Bimal K Bose, Power Electronics in Renewable Energy Systems and smart grid technology and applications, IEEEWiley	
10.HaithumABURub,PowerElectronicsinRenewableEnergySystemsandsmartgridtechnologyandapplications,IEEE Wiley	
11.NPTELwebsiteVideolecturesbyB.G.Fernandes	
SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT– II,UNIT- III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

IndustryTaughtCourse-IIIndustrialOrganization&FinancialManagement		
TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:03Hours/Week	EndSemesterExamination:60Marks	Total:03
	ContinuousAssessment:40Marks	

CoursePre-requisites:

Thestudentsshouldhaveknowledgeofprofessionalskilldevelopmentandbasicmanagementterms

CourseObjectives:

1. Tounderstandthebasicoperationsinanyorganization,technicalskillsetsrequiredbypeople.
2. TolearntermslikeDepreciation,Replacementengineering,ProductEngineering,ProductionPlanningandInventory Control.
3. TounderstandtheJobEvaluationtechniques,PersonnelManagement,BehavioralAspectsofManagementand Operations Research.

CourseOutcomes:

Thestudentwillbeableto

1.	Tounderstandthebasictermsrelatedtomanagementlikefunction,principles.
2.	Tounderstandvarioustypeofcompaniesandthevariousfinancialaspectsrelatedwiththecompany.
3.	Tounderstandthetermsrelatedwiththedepreciation,replacementandproductsofthecompany
4	Tounderstandtheproductionandinventoryrelatedconcept
5	Tounderstandtheconceptsoffinancialmanagementandcapital
6	Tounderstandtheconceptsoffinancialservices,investmentandstockmarket

UNIT - I	**Management**	**(06Hours)**
	Introduction, Phases in Management: scientific management, Behavioral management and Information technology and operations research. Industrial Management, Contents and Principle of Management, FunctionsofManagement:Planning,coordination,motivationandcontrol.Leadership:Qualitiesof leader, Leading Process. Education and Training of Management. Elements of Quality Management System ISO 9001-2008. SAP, life insurance	
UNIT- II	**FormationofCompanyandstartups**	**(06Hours)**
	Introduction,Companydefinition,TypesofcompanyStructure:Proprietorship,Partnership,JointStock companies,Limitedand UnlimitedCompany,PrivateandPublic,Corporative,Public,PrivateandJoint Sector, Trust and Holding Companies. **Startups** Startup opportunities: The New Industrial Revolution – The Big Idea- Generate Ideas with Brainstorming-Business Startup–Ideation- VentureChoices–TheRiseof ThestartupEconomy-The SixForcesofChange–TheStartupEquation-TheEntrepreneurialEcosystem -EntrepreneurshipinIndia. Government Initiatives.	
UNIT- III	**Depreciation,ReplacementandProductEngineering**	**(06Hours)**
	Introduction,objectiveofBusinessEnterprise,DepreciationandDepreciationCalculation,Estimationof Life of an Engineering Aspects, Replacement of Plant and Machinery, Product Classification, Initiation of Product, Production Analysis, simplifications and Standardization, Product Research, **ProductionPlanningandInventoryControl** Introduction, Production System, Production Types, Production Planning functions, Efficiency of Production planning and Drawing Office Organization. Inventory Control Functions, Procedures for Purchase,	
UNIT-IV	**JobEvaluationandPersonnelManagement**	**(06Hours)**
	Introduction, Job Evaluations and Analysis, Classification of Job evaluation techniques, Evaluation of wagesstructures,systemofmeritrating,measurementofresponsibilityandwageincentives.Importance of personnel management, human relations, Functions of personnel management. , labour participation in management. Labour turnover, industrial disputes. **BehavioralAspectsofManagementandOperationsResearch** Scientificmanagement,HawthorneStudies,EltonMayo,TheoryXandTheoryY,Hertzberg's motivation andHygieneTheory, OrganizationalgoalsandCulture. Stressesat workplace, Interpersonal Behavior, power and Politics in organization.,	
UNIT -V	**Financialmanagementandcapital**	**(06Hours)**
	FinancialManagement MicroEconomics,PrinciplesofAccounting,QuantitativeMethodsandStatistics FinancialModeling,ManagerialEconomics,CorporateFinance,ScopeandFunctionsandroleofFinance Managers, Scope of Finance; Financial Management	

	Capital Classification of Capital, Capital Procurement, Cost of Capital, Cost of Capital; Cost of Debt; Cost of Preference Capital; Cost of Equity Capital; Approaches to Derive Cost of Equity; Weighted Average Working capital, OperatingCycle Method, :Managementof Cash Motivesfor Holding Cash;Facetsof Cash Management;Cash Planning;	
UNIT - VI	Financialservices,investmentandstockmarket	**(06Hours)**
	Meaningoffinancialservices,types,playersinfinancialservices,merchantbanking, **Primary market** : face value of shares , debenture issueof shares on premium , discountinitial public offer (IPO) , Follow on public offer (FPO). **Secondarymarket**:differencesbetweenprimaryandsecondarymarket,roleofstockexchanges, demutualization of stock exchanges **Derivatives**:Typesofderivativesoptionalpremium,commodityexchange,commodityderivative **Investment** NeedofInvestment,Physicalassetslikerealestate,gold/jewellery,commoditiesetc,Currencytrading, Commodity market **Stockmarket** **Share market basics** B.S.E.. N.S.E : organizational structure , index construction , sensex , NIFTY , sectors,settlement,rollingsettlement,payinandpayout,nodeliveryperiod,auctionofshares,investor protection, Dmat account, types of charges, primary and secondary market **Intra-day trading**, **Chart study,** Basics of Candle stick chart, analysis of candlestick chart, fifteen candle stick patterns,	

Assignments(ProjectBasedLearning): Studentsneedtocompletesixassignmentsfromfollowinglist

1. Casestudy1studyofastartupcompany
2. Casestudy2studyofhumanresourcedepartmentofacompany
3. Casestudy3visittoBankandstudy facilities
4. Conductinganinterviewforacompany
5. CollectinginformationforInitiatingastartupcompanyinagroup
6. FundamentalTechnicalanalysisofashare
7. Onlineinvestmentincommoditymarket
8. Onlinecurrencytrading
9. Openingasavingbankaccount
10. OnlineOpeningofadmataccount,
11. Openingaofatradingaccount
12. Purchasingashareinintradaytradingwith minimumrupeestogetintroduction

TextBooks:

1. S.K.Basu,K.C.Sahu,B.Rajiv"IndustrialOrganizationand Management",PHIlearningPrivateLimited,NewDelhi.
2. *"IndustrialEngineeringandManagement",O.P.Khanna,* DhanpatRai&Sons.NewDelhi.

ReferenceBooks:

1. HermanB.Henderson,AlbertE.Haas**"**IndustrialOrganizationandManagementFundamentals**",**IndustrialPress.
2. K.P.Kaur"ProfessionalManagementinIndustrialOrganisations",,DeepandDeepPublications.
3. Dr.AnilKumarDhagatFinancialManagement2011,ISBN:9789350040225,9350040220,Pagecount:564,May2011, Publisher:Wiley India Pvt. Limited
4. DChandraBose,"Fundamentalsoffinancialmanagement"PHILearningPrivatelimited
5. PrasannaChandra,"FinancialManagementTheoryandPractice"TataMcGrawHillEducationPvt.Limited.sedition ISBN:9789353166533,9353166535,2019
6. RodneyHobsonSharesmadeSimple,Harrymanhouse ltd.
7. StockMarketinvestingforbegineersTychoPress
8. RobertASchwartz,TheeconomicfunctionofStockexchange,Springer
9. GagariChakrabarti,MomentumtradingonIndianStockMarket,Springer
10. GaourishankarHiremath,IndianStockMarket,Springer
11. PalgraveMcmillan,Startupsandinnovationecosystemsinemergingmarkets,Springer
12. AgnieszkaSkala,Digitalstartupsintransitioneconomics,PalgraveMcmillan,Springer
13. ManuelStagers,UniversityStartupsandspinoffs,Apress

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

DatabaseManagementSystem(SQL)		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04 Hours/Week	EndSemesterExamination:60Marks	Theory: 04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks	Total:05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1) Basicunderstandingofdataanddatastructure
2) Basicunderstandingofprogramminglanguage

CourseObjectives:

Identifyvarioustechniquestocommunicatewithdatabase. Relate relevant data for effective processing of data.
Construct a database to maintain data adroitly.Studyvariousqueriesandtoolstodealwiththed ata.
Understandtherelationbetweendatasetandrespectivemeanstoaccessit. Understand influence of data in the effective development of software.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Designdatabasetostoredatarelatedwithapplication.
2	Identifytechniquetodealwithdata
3	ExtendpowerofSQLbyaddingprogrammingparadigm
4	Predictsuitableenvironmentfordataprocessingaspertypedata
5	ApplyknowledgeofDBMStoprocessthesoftwareefficiently
6	Discussdatacomputingtechniques

UNIT–I	**IntroductiontoDBMS**	**(08Hours)**
	What is database management system, Use of database system, view of data, relational databases, databasearchitecture,transactionmanagement,DataModelsTheimportanceofdatamodels,Basic buildingblocks,Business rules, The evolution ofdata models, Degreesofdata abstraction.Design of Database, ER Diagram Database design. ER Model: overview of ER-Model, Constraints, ER-Diagrams, Extended ER Diagrams.	
UNIT- II	**Relationaldatabasemodel**	**(08Hours)**
	Logicalviewof data,keys,integrity rules. DesignofRelational Database: featuresof good relational database design, Normalization (1NF, 2NF, 3NF, BCNF). Relational Algebra and Calculus Relationalalgebra:introduction,Selectionandprojection,setoperations,renaming,Joins,Division, syntax,semantics.Operators,groupingandungrouping,relationalcomparison.Calculus:Tuple relationalcalculus,DomainrelationalCalculus,calculusvsalgebra,computationalcapabilities	
UNIT-III	**IntegrityConstraints**	**(08Hours)**
	Whatareconstraints,typesofconstrains,Integrityconstraints,Views:Introductiontoviews,data independence, security, updates on views,comparison between tables and views Introduction to SQL: data definition, aggregate function, Null Values, nested sub queries, Joinedrelations.Triggers.	
UNIT-IV	**PL/SQL**	**(08Hours)**
	Introduction,DeclaringVariables,WritingExecutableStatements,InteractingwithOracleServer , Writing Control Structures , Working with Composite Data Types , Writing Explicit Cursors , Writing Implicit Cursors , Handling Exceptions , Creating Procedures , Creating Functions , Managing Subprograms, Creating Packages,More Package concepts,Oracle supplied Packages, ManipulatingLargeObjects,CreatingDatabaseTriggers.	
UNIT-V	**Transactionmanagement**	**(08Hours)**
	ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management	
UNIT-VI	**DataIntensiveComputing**	**(08Hours)**

	Introductiontobigdata,unstructureddataprocessingusingHadoop,NoSQLdatabaseusing MangoDB.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsandnotlimitedto

Listofexperiments:

1) DrawanERDiagramtomaintaindatabaseof Bank
2) NormalizethedatabaseofLibrary,uptoBCNF
3) Perform the following operation for demonstrating the insertion, updation and deletion using the referential integrity constraints
4) Calculateturnoverofabanksinpuneusinggroupbyquery
5) WAPtoimplementautorollbackoptiononDeletionusingtrigger.
6) WAPtoimplementProceduretocalculatesquareofanumber.
7) ImplementimplicitcursorusingPL/SQL.
8) SimulatetwophaselockingprotocolonthedatabaseofMovie.
9) PerformdocumentprocessingusingMangoDB,.
10) SolvewordcountproblemusingHadoop.

ProjectBasedLearning:

1. Make a project to maintain employee data using files and dynamic object/structure. The project should be able to read, write, modify,addandsearchrecords.Alsodemonstratetheeffectofperformingchangeinemployerdatadefinitionafterfewrecordshave been added.
2. MakeanextendedERdiagramforinsurancemanagementsystem.Transformthisintoralationdesignandimplementtheserelationswith appropriate domain and integrity constraints.
3. Employvariousdatacontrolrestrictionsondatabases,relationsandattributesofrelations.
4. Create a phonebook which enables user to save contacts with additional information and provides various retrieval mechanisms. Provisions should be made to view data in mutliple ways.
5. Designanddevelopalibrarymanagementsystem.Therelationsinthesystemshouldbenormaliseduptо BCNF
6. Designanddevelopainventorymanagementsystemandcreatemultipleviewsontherelationssothatusersnotauthorised toedit the relations should be able to views the data.
7. Implementofaudittrailsandbackupon relations.
8. Create a student result calculation system. However when updating final results after calculation should be only of stduents who paid complete fees, such that transaction of each row is executed seperately. Hint- use explicit cursor
9. Developastudentdatamanagementsystemusinghashfiles.
10. InstallationofaNoSQLdatabaseandimplementingasimplestudentdatabasetocomparewithSQLdatabase.

Textbook:

1. ASilberschatz,HKorth,SSudarshan,"DatabaseSystemandConcepts",SixthEditionMcGraw-Hill
2. OracleSQLandPL/SQLGuideTill10gR2
3. RamkrishnaR.,GehrkeJ.,DatabaseManagementSystems,3rdEdition,McGrawHill

ReferenceBooks:

1. Rob,Coronel,"DatabaseSystems",SeventhEdition,CengageLearning.
2. BipinDesai,IntroductiontoDatabaseManagementSystems.
3. GroffJamesR.,PaulWeinberg,LANtimesguidetoSQL.

SyllabusforUnitTest:

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

ITPractices

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Practical:02Hours/Week	TermWork:25Marks&Oral:25 Marks	Total:- 01

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	CProgramming

CourseObjectives:

This syllabus is a comprehensive study of Core Java. It contains complete industrial Java topics to learn the Java programming language in detail. Java is object oriented, platform independent, simple, secure, architectural–neutral, portable, robust, multi-threaded, high performance, distributed and dynamic.

CourseOutcomes: Studentswillbeableto

1.	BecomefamiliarwiththefeaturesofJavaLanguage&fundamentals
2.	DiscoverhowtowriteJavacodeaccordingtoObject-OrientedProgrammingprinciples.
3.	BecomecomfortablewithconceptssuchasI/OoperationsinJAVA&multithreadedprogramming
4	LearnJavaAPIsforCollections,I/OStreams
5	DesignGUIapplicationsandAppletsusingAWTand Swing.
6	DevelopMultithreadedandNetworkingapplications.

UNIT-I	**JavaLanguageEnvironment&JavaFundamentals:**	
	Object Oriented, Platform Independent, Automatic Memory Management, Compiled /Interpreted approach,Robust,Secure,DynamicLinking,Multi-Threaded,Built-inNetworking,Datatypes, Operators, Control Statements, Arrays, Enhanced for-loop, Enumerated types, Static import, Auto boxing, C-style formatted I/O, Variable arguments.	
UNIT- II	**Packages&ExceptionHandling:**	
	Whypackages,UnderstandingClasspath,Accessmodifiers&theirScope,Whenanexception occurs,ImportanceofExceptionHandling,ExceptionPropagation,ExceptionTypes,Usingtryand catch, throw, throws, finally, Writing User defined Exceptions	
UNIT-III	**I/OOperationsinJava&MultithreadedProgramming:**	
	ByteOrientedStreams,FileHandling,ReadersandWriters,IntroductiontoMulti-Threading, Understanding Threads & its States,JavaThreading Model,Threadclass & Runnable Interface, Thread Priorities, Thread Synchronization, Interthread Communication, Preventing Deadlocks.	
UNIT-IV	**JavaUtilPackage/CollectionsFramework:**	
	Collection&IteratorInterface,Enumeration,ListandArrayList,Vector,Comparator,SetInterface & Sorted Set, Hashtable, Properties	
UNIT-V	**Generics&AbstractWindowToolkit:**	
	Introduction to Generics, Using Built-in Generics Collections, Writing Simple Generic Class, Bounded Generics, Wild Card Generics, Graphics, Color and Font, AWT Components/Controls, Event Handling & Layouts.	
UNIT- VI	**SwingProgramming:**	
	IntroductiontoSwing&MVCArchitecture,LightWeightComponent,SwingHierarchy,Atomic Components e.g. JButton, JList and more, Intermediate Container e.g.JPanel, JSplitPane and more, Top-Level Container e.g. JFrame and JApplet, Swing Related Events.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsfrombelowlist.

1. WriteaJavaprogramthattakesanumberasinputandprintsitsmultiplicationtableupto10.
2. ImplementaJavafunctionthatcalculatesthesumofdigitsforagivenchararrayconsistingofthedigits'0'to '9'.The function should return the digit sum as a long value
3. Writeajavaprogramtoimplementthevectors.
4. Writeajavaprogramtoopenafileanddisplaythecontentsintheconsolewindow.
5. Writeajavaprogramtoread thestudentdatafromuserandstoreitinthefile.
6. DesignaAWTprogramtoprintthefactorialforaninputvalue.
7. DesignanAWTprogramtoperformvariousstringoperationslikereversestring,stringconcatenation etc.
8. Writeajavaprogramtoimplementexceptionhandling.

Assignments:(Projectbasedlearning)

1. WriteaJavaprogramtoprintthe areaandperimeterofacircle.
2. WriteaJavaprogramtocountthe letters,spaces,numbersandothercharactersofaninputstring.
3. Writeajavaprogramtoimplementthreadlifecycle.
4. Writeajavaprogramtoimplementmultithreading.
5. Writeajavaprogramtocopythecontentsfromonefiletootherfile.
6. DesignanAWTapplicationthatcontainstheinterfacetoaddstudentinformationanddisplaythesame.
7. DesignacalculatorbasedonAWTapplication.
8. DesignanAWTapplicationtogenerateresultmarkssheet.

TextBooks:

1. VaishaliShah,SharnamShah,CoreJava8forBeginners,FirstEdition,SPD, 2015
2. R.NageswaraRao,CoreJava:AnIntegratedApproach,FirstEdition,DreamTech,2008

ReferenceBooks:

1. HerbertSchildt,Java:TheCompleteReference, 9thEdition,McGrawHill,2014
2. Hortsman,CoreJava,VolumeI:Fundamentals,9thEdition,Pearson,2013

VocationalCourse-IISolarPowerPlantDesigning

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Practical:02Hours/Week	TermWork:25Marks&Oral:25Marks	Total:01

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	EnergySystems,potentialandneedofrenewableenergy.

CourseObjectives:

	Tounderstandtheneedandscopeofcleanersourcesofenergy. To motivate the use of Solar and Solar based applications.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	Discussthevariousenergysystemsandcompareitsneed,adaptabilityandpotential.
2	Classifytheenergysourcesandunderstanditscapacityandapplications.
3	DiscusstheneedandvariousconceptsrelatedtoSolarsystem's.
4	UnderstandthebasicsofSolarPhotovoltaicsystems,examineitstypesandinstallations.
5	Identifytheneedandscopeofsolar safety.
6	DesignofSolar Electricsystemanditsapplications

UNIT–I	**NEEDOFENERGY**	
	Introduction, Definition of Power and energy, difference between power and energy, the role of energy in development, Limitation of renewable energy sources their usefulness seasonal nature, requirement, need for the use of new energy sources. Overview of Global EnergyScenario Various sources of Renewable energy. Potential of Renewable energy. Solar irradiance, irradiation,sunpathdiagram&peaksunhour	
UNIT- II	**TYPESOFENERGYSOURCES**	
	Conventional energysourcesHydroElectric,Thermal,Nuclear,Non-ConventionalEnergy sourcesBio-mass,geo-thermal,solar,windenergy,oceanenergy,waveenergy,advantagesand disadvantages,challenges.	
UNIT-III	**SOLARSYSTEM**	
	Solar system: Energy from the sun, solar window, atmospheric effects, diffused radiations, Air mass, effect of Air Mass, seasonal effects, environmental effects on standard test conditions.	
UNIT-IV	**PRINCIPLESOFSOLARPHOTOVOLTAICSYSTEMS**	
	Solar Photovoltaic energy conversion and utilization, solar power generation systems a) off-grid systemsb)gridconnectedsystemsc)powercontrolandmanagementsystems,economicsofsolar photovoltaicsystems,WorldEnergyRequirement,EnergyandRoleofPhotovoltaic,TypesofPV Installation,CommonSystemstype,GRID-TIEDSystem,HybridSystems,PhotovoltaicinEnergy Supply, Types of the solar power plant, the concept of net & gross metering ,Selectionofinverter,module&balanceofsystem,Array,string&cablelayout-KW(rooftop)& MW(ground-mounted)System	
UNIT-V	**SOLARSAFETY**	
	Electricalsafety,electricalsafetyrules,simplefirstaid,generalsafetyoftoolsandequipment,fire extinguishers, types of fire extinguishers, Guideline of Safety measurement in solar plant, Performance and monitoring system, ways to maximize energy, solar cell utility – scale system performance.	
UNIT-VI	**SolarElectricSystemInstallationandService**	
	Applications of Solar Water Heater, Solar lighting systems, Solar cooking, Roof Top, Solar Integration to grid. Design calculation for solar plant , Protection system, earthing calculation & cable sizing	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsandnotlimitedto

1) StudyofSolarPhotovoltaicFencing
2) StudyofSolarCookers

3) StudyofSolarWaterHeater
4) StudyofSolar Dryer
5) StudyofSolarWaterPumpingSystem
6) StudyofSolarLighting System
7) StudyofSolarPhotovoltaicSystem
8) StudyofSolarDistillationSystem
9) StudyofSolar Pond
10) VisittoRenewableEnergyIntegrated Plant
11) OpencircuitvoltageofPVcells
12) ShortCircuitCurrentofPVcells

TextbookandReferenceBooks:

1) SolarEnergy:FundamentalsandApplicationsBookbyH.PGarg,TataMcGrawHillPublishingCompanyLtd.
2) FromSunlighttoElectricity:APracticalHandbookonSolarPhotovoltaicApplicationsSuneelDeambi,TheEnergyand Resources Institute, TERI
3) SolarElectricityHandbook-2019Edition:ASimple,PracticalGuidetoSolarEnergy -DesigningandInstallingSolar Photovoltaic Systems. Michael Boxwell
4) SolarEnergy:ThePhysicsandEngineeringofPhotovoltaicConversion,TechnologiesandSystems.

BharatiVidyapeethDeemedtobeUniversity,Pune
Faculty of Engineering & Technology
(ElectricalEngineering)
Programme:B.TechElectricalEngineeringSem–V(2020Course)

AdvancedMicrocontroller&EmbeddedSystems		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04	EndSemesterExamination:60Marks	Theory:04
Practical:02	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Oral:25 Marks	Total: 05

CoursePre-requisites:

TheStudentsshouldhavepriorknowledgeof

Computersystems,DigitalElectronicsandnecessityofautomationandrealtimeapplications.

CourseObjectives:

The primary objective of this course is to introduce the student's with the basic understanding of embedded systems design and role of microcontrollers. This will include system requirements and real time industrial based applications.

CourseOutcomes: Afterlearningthiscoursestudentswillbeable to

1	UnderstandthebasicconceptofMicrocontrollersandroleofembeddedsystems.
2	CompareandElaboratetheaddressingmodessupportedby8051
3	IdentifyandexecutetheinterruptssupportedbyMCS-51
4	IdentifytheneedofPICMicrocontrollersandelaborateitsapplications
5	Illustratetheindustrialapplicationsofmicrocontrollers
6	Discussthedesignanddevelopmenttoolsrequiredforembeddedsystems.

UNIT–I	**INTRODUCTION**	**(08Hours)**
	Embeddedsystemsandgeneralpurposecomputersystems,history,classifications,applicationsand purpose of embedded systems. **CoreofEmbeddedSystems:** Microprocessors and microcontrollers, RISC and CISC processors, Architecture of 8051, Memory organization,Pindiagramof8051,Specialfunctionregisters.OverviewofAVRfamilyits Architectureandapplications.	
UNIT-II	**MCS-51AddressingmodesandInstructionset**	**(08Hours)**
	8051Addressingmodes,MCS51Instructionset,8051Instructionandsimpleprograms, Development systems and Tools, Software simulators of 8051.	
UNIT-III	**Interrupts,Timer/countersandserialcommunication**	**(08Hours)**
	Interrupts,InterruptsinMCS-51,TimersandCounters,Serialcommunication,modesofserial communication.Interruptcontrol,Interruptpriority,softwareandhardwareinterrupts,Interrupt initialization.	
UNIT-IV	**IntroductiontoPICMicrocontrollers**	**(08Hours)**
	PIC Microcontrollers: Overview and features, PIC 16F876, PIC 16F877, Addressing modes, PinDiagram,Applications,Interrupts,Interfacingapplications,CCP,SSP,I2C,SPIinPIC Microcontrollers.	
UNIT-V	**IndustrialApplicationsofMicrocontrollers**	**(08Hours)**
	LCDInterfacing,DCandSteppermotorinterfacing,Trafficlightcontrolsystem,Measurement applications, Automation and control applications, Introduction to ADC and DAC.	
UNIT-VI	**DesignandDevelopment**	**(08Hours)**
	Embedded System development environment - IDE, Types of file generated on cross compilation, disassembler/decompiler,simulator,emulatoranddebugging,embeddedproductdevelopmentlife-cycle,trendsinembeddedindustry.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsandnotlimitedto

1. StudyofArchitectureof8051Microntroller
2. Programsofaddition,subtraction,multiplicationetc.
3. Programsonlogicalanddecisionmakinggroupofinstructions
4. Programsrelatedtointerrupt,timerandserialcommunicationlogic
5. Programsrelatedtodatatransferbetweeninternalandexternalmemory.
6. Simulatorbasedprogrammingtocheckthestatusofmicrocontrollerperipherals.
7. StudyofPICMicrocontrollerarchitecture.
8. InterfacingwithADCandDAC
9. InterfacingofPIC16F876MicrocontrollerwithDCMotor
10. InterfacingofPIC16F876MicrocontrollerwithSteppermotor
11. InterfacingofPIC16F876withLCD
12. InterfacingofPIC16F876withTrafficlightcontrolsystem

ProjectBasedLearning

1. DesignofRegulatedpowersupplyinsoftware tool
2. DesignofLEDblinkingbasedapplicationinsoftware tool
3. Designofahouseholdbasedapplicationwithrespecttosafety,alarmandautomationinsotwaretools
4. StudyofvariousMicrocontrollerbasedDataSheets
5. IdentificationofvariousMicrocontrollersanditsperipherals
6. UseofIDEbasedapplicationstocheckthestatusofstatusregisters
7. DesignofInterfacingmodelsformeasurementapplications
8. DesignofinterfacingmodelswithPICmicrocontrollersforElectricsystembasedapplications
9. IdentifyingtheroleofMicrocontrolleranditsperipheralsinE-Vehicleindustryforautomationandsmarttechnology
10. Comparisonofvariousprotocolsusedforembeddedsystems.

TextBooks:

1. AjayDeshmukh,'MicrocontrollersTheoryandApplications',TATAMcGraw Hill.
2. B.Ram"FundamentalsofMicroprocessorsandMicrocomputers",edition1995DhanapatRai Publications

ReferenceBooks:

1. M.A.Mazidi"The8051microcontroller&embeddedsystems",Pearson EducationPublication
2. K.J.Ayala"The8051microcontrollerArchitectureprogrammingandapplications"
3. KennethAyala,Delmar,CengageFearning,""The8051MicrocontrollerArchitecture,Programming& Applications" Third Edition , TATA McGraw Hill
4. DesignwithPICmicrocontrollers –JohnPeatman,PearsonEducationAsia,LPE

SyllabusforUnitTest:

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

ElectricalMachineDesign&Analysis

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:04
Tutorial:01Hours/Week	ContinuousAssessment:40Marks	Total: 04

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	VariousMaterialsUsedinElectricalMachines
2.	Types,construction&workingofTransformers
3.	Types,construction&workingofDC&ACMachines

CourseObjectives:

	ThiscourseintroducesDesignofElectricalMachinesforthegivenspecifications

CourseOutcomes:Thestudentswillbeableto

1.	Applytheconceptsofmachinesandmaterialsindesignofmachines.
2.	Determinethemaindimensionsandperformanceparametersof1-phaseand3-phasetransformer.
3.	Analyzeandestimatethetransformerperformanceparameters,
4	Estimatethemaindimensionsandperformanceparametersof3-ΦInductionMotorbyunderstandingthegeneralconcepts and constraints in design.
5	Analyze, estimate the performance parameters of Squirrel Cage Rotor of 3-Φ Induction Motor and optimize the design using FEA.
6	Analyze, estimate the performance parameters of Wound Rotor of 3-Φ Induction Motor and optimize the design using FEA.

UNIT-I	**FundamentalAspects,ThermalDesignAspectsandGeneralconcepts,Constraintsin design of Electrical Machines.**	**(08Hours)**
	Introduction,Designfactors,Limitationsindesign,BasicPrinciples. Modes of heat dissipation, Heating and cooling curves, calculation of heating and cooling time constants,Ratingofmachines,selectionofmotorpowerratings,Typesofdutiesandratingsand selection of motor capacity. Methods of measurement of temperature rise. Measurement of winding temperature. Relation between Rating and Dimensions of Rotating Machines: Main dimensions, Total loadings,Specificloadings,Outputequation,Factorsaffectingsizeofrotatingmachines,Choice of specific magnetic & specific electric loading.	
UNIT-II	**DesignofTransformer**	**(08Hours)**
	Output equation with usual notations, design of core, yoke and windings of transformer. Tank design.Designofsmallsinglephasetransformers.Generalizedflowchartfordesignofelectrical machines.	
UNIT-III	**OperatingCharacteristicsofTransformer**	**(08Hours)**
	Estimationofresistanceandleakagereactanceoftransformer,regulationoftransformers. Calculation of mechanical forces, Estimation of no-load current. AnalysisoftransformerusingAnsysMaxwell2D(Notheoryquestionsonthesetopics).	
UNIT-IV	**Designof3-ΦInductionMotor:StatorDesign**	**(08Hours)**
	GeneralSpecificationsof3-ΦInductionMotor.Outputequation,Choiceofaveragefluxdensity in air gap, choice of ampere conductors per meter. Efficiency and Power factor, Main Dimensions.Statorwindingdesign:turnsperphase,statorconductors.Statorslotdesign:Shape ofslots,numberofslotsandareaofslots.Lengthofmeanturn.Statorteethdesign,Designof statorcore.	
UNIT-V	**Designof3-ΦInductionMotors:RotorDesign**	**(08Hours)**
	Air gap length: factors affecting the length of air gap, relations for calculating the length of air gap.	

	Squirrel Cage Rotor Design: Number of rotor slots: the effect of harmonics, rules for selecting rotor slots, reduction of harmonic torques. Design of rotor slots and bars, design of end rings. Wound Rotor Design: Number of rotor slots, number of rotor turns, area of rotor conductors,Design of winding, Design of rotor teeth & rotor core. Design optimization and Analysis using various FEA (Finite Element Analysis) based machine design packages - Maxwell 2D, 3D (No theory questions on these topics).	
UNIT-VI	**OperatingCharacteristicsof3-ΦInductionMotors**	**(08Hours)**
	Estimation of– No load current: Magnetizing current and loss component. Short circuit current: Stator resistance, Rotor resistance and Leakage reactance. Dispersion Coefficient – Effect of dispersion coefficient on maximum power factor, overload capacity. Effect of change of air gap length, number of poles and frequency. Calculation of magnetic leakage and unbalanced magnetic pull.	

IndustrialVisit:Industrialvisittoamanufacturingunitoftransformerorinductionmotor.

Tutorial: DrawingsheetsandDesignproblems.(threeinAutoCAD)

- ✓ Details(Elevation,sideview,topview)andassemblyof3-phase(powerordistribution)
- ✓ transformerwithdesignreport.
- ✓ DetailsandlayoutofACwindingwithdesign report.
- ✓ Assemblyof3-phaseinductionmotor.(onlysheet)
- ✓ ReportbasedonIndustrialvisittoamanufacturingunit.(TransformerorInductionmotor).
- ✓ Assemblyof1-phase transformer.
- ✓ Detailsandassemblyof3-phaseInductionMotorwithdesignreport.

ProjectBasedLearning:

1. Literaturesurveyonthermaldesignaspectsoftransformer&rotatingelectricalmachines(anyone)
2. Designofsmall1-phasetransformeranditsdesignsheet.
3. Schematicofbasicstructureofanyonerotatingelectricalmachines,properties(electrical,mechanical,insulatingand dielectric) of each material (conducting, magnetic, insulating and dielectric materials) used in machines.
4. Analyticaldesignof1-phaseTransformerusingMATLAB.
5. AnalyticaldesignanddesignoptimizationofInductionMotorusingRMxprt
6. ElectromagneticanalysisanddesignoptimizationoftransformerusingMaxwell2D& 3D.
7. ElectromagneticanalysisofInductionMotorusingMaxwell2D&3D.

TextBooks:

1. SawhneyA.K.,*ElectricalMachineDesign*,DhanpathRai&Co.(P)LtdSixthEdition:2006
2. M.G.Say–TheoryandPerformanceandDesignofA.C.Machines,3rdEdition,ELBSLondon.
3. P.P.SilvesterandFerraris'sbookonElectricalMachineDesignusingFEA

ReferenceBooks:

A Shanmugasundaram, G. Gangadharan, R. Palani, - Electrical Machine Design Data Book, 3rd Edition, 3rd Reprint 1988 - Wiely Eastern Ltd., - New Delhi

K.L.Narang,ATextBookofElectricalEngineeringDrawings,ReprintEdition:1993/94–SatyaPrakashan,NewDelhi.

VishnuMurti,"ComputerAidedDesignforElectricalMachines",B.S.Publications

SyllabusforUnitTest:

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

IndustrialAutomation

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks Oral:25Marks	Total: 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	Logicgatesoperations,Booleanalgebra,Datatypes(integer,float,unsigned)

CourseObjectives:

	Thiscourse aims atunderstanding thebasic conceptsPLC hardware and PLC software and Programminglanguage likeladder, constructionofladderdiagram,theirsymbolandcomponentoftheinstruction.Knowledgeofanalogand digitalinputandOutput devices, PID, SCADA and Communication Protocols.

CourseOutcomes:

1.	DescribeProgrammableLogicControlleralongwiththeblockdiagramwithitscomponentsindetail.
2.	DeveloparchitectureofSCADAexplainingeachunitindetail.
3.	DevelopasoftwareprogramusingmodernengineeringtoolsandtechniqueforPLCandSCADA.
4	EnlistvariousindustrialapplicationsusingPLCandSCADA.
5	DescribetheimportanceofSCADAincriticalinfrastructure.
6	Execute,debugandtesttheprogramsdevelopedfordigitalandanalogoperations.

UNIT-I	**Introductionto PLC**	**(08Hours)**
	History of PLC, PLC system, Block Diagram of general PLC, PLC input and output module, Sensors and actuators for PLC, Central Processing Unit, Monitors, solid state memory, Power supplies, HMI andInterfaces,SelectioncriteriaforPLC,PLCadvantagesanddisadvantages,PresentPLC manufacturers.IntroductiontoRockwell,Schnider,MitsubishiPLCs.	
UNIT–II	**Programmingof PLC**	**(08Hours)**
	Input ON/OFF switching devices, Input analog devices, Output ON/OFF devices, Output analog devices, Programming equipments, Introduction of Programming languages, Basic components & symbolsinladderdiagram,ConstructionofPLCladderdiagramforprogramming,Fundamentalsof ladder diagram, Boolean logic & relay logic, programming ON/OFF Inputs to produce ON/OFF outputs.	
UNIT–III	**PLCApplications**	**(08Hours)**
	Analog PLC operation, PID control of continuous processes, closed loop systems and common problems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface. Industrial process example: Motors Controls - AC Motor starter, AC motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive. Temperature, level and Flow control.	
UNIT-IV	**SCADASystemsOverview**	**(08Hours)**
	Introduction and definitions of SCADA, Principles of SCADA systems, SCADA system evolution. Basic SCADA system Architecture: Human Machine Interface, Master Terminal Unit, Remote Terminal Unit. SCADA data transfer through PLCC. Communication Technologies, Communication systemcomponents,SCADACommunicationinanelectricalpowersystem.SCADAsystemdesirable Properties,RealTimeSystem,SCADAserver,SCADAfunctions.	
UNIT-V	**SCADAArchitecture**	**(08Hours)**
	First generation - Monolithic, Second generation - Distributed, Third generation – Networked Architecture, Intelligent Electronic Devices. Operation and control of interconnected power system, Automatic substation control, SCADA configuration, Energy management system, system operating states,systemsecurity,Stateestimation,andSCADAsystemsecurityissuesoverview.SCADAsystems in the critical Infrastructure: Conventional Electric Power Generation, water Purification System, Chemical Plant, Petroleum Refining Process.	
UNIT-VI	**TheEvolutionProtocols**	**(08Hours)**
	Overview of Open systems interconnection (OSI) Model, Functions of OSI Model Layers, OSI Protocols, Functions of Transmission control protocol / Internet protocol (TCP/IP) Layers, TCP/IP protocol,DNP3protocol,IEClayeredarchitecture,Ethernet/IP,ProcessFieldbus(Profibus),Modbus, IEC61850 standard, OFC, Canbus The Security Implications of the SCADA protocols.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.Fourfromfirst6andfourfromnext6outofgivenbelow.

1.Interfacingoflamp&buttonwithPLCforON&OFFoperation.Verifyalllogicgates. 2.Performed delayed operation of lamp by using push button.
3. UP/DOWNcounterwithRESETinstruction.
4. Combinationofcounter&timerforlampON/OFFoperation.
5. Set/Resetoperation:onepushbuttonforON&otherpushbuttonforOFFoperation.
6. DOLstarter&stardeltastarteroperationbyusingPLC.
7. PLCinterfacedwithHMI&statusread/commandtransferoperation.
8.Parameter reading of PLC interface with SCADA.
9. AlarmannunciationusingPLC&SCADA.
10. TanklevelcontrolbyusingPLC&SCADA.
11. TemperaturemonitoringbyusingPLC&SCADA.
12. Reporting&trendinginSCADAsystem.

ProjectbasedLearningAssignments:

1. ManlessRaliwayGateCrosiing.
2. AutomaticCarParkingSystem-multiLevel.
3. AutomaticBottleFillingApplication(Water,Chemical,Paint,OilBased)
4. AutomaticSecuritySystem(Car,Home,Office,AppartmentsBased)
5. AutomaticControllingofParameters(Temperature,Level,Pressusre,Flow,Etc.,)
6. AutomaticDamShutterOpen/closeSystem
7. DoorOpenandClosingSystem
8. BoilerPressureMonitoringandControllingSystem
9. ElevatorSystem
10. AutomaticGuidedVehicle
11. AutomaticCarWashingSystem
12D.CMotorSpeedMonitoringSystem
13. FourAxisWelding Robot
14. EnergySavingSystem
15. IndustrialTimerControllerforMultipleMachines
16. AutomaticCoffeeVendingMachine
17. A.C.MotorControllingSystem
18. WirelessEnergyMeter
19. AutomaticIndustrialorSchoolorCollegeTimeManagementSystem
20. FingerPrintBasedVotingMachine
21. AutomaticPowerFactorControllingSystem
22. AutomaticVehicleAccidentInformationSystem
23. MovingMessageDisplay
24. MultipleTransformerFaultDetectionandProductionSystem
25. GasLeakageDetectionandAutoDialing
26. IntelligentBrakingSystem
27. Mini-computerDictionary
28. AutomaticMedicineAnnouncementSystem
29. AutomaticVehicleOverSpeedIndicationandControllingSystem
30. TalkingKeyPadforBlindPeople
31. PhaseSequenceIndicatorandControllingSystem
32. AutomaticCollegeBellWithAnnouncementSystem

IndustrialVisits:

1. VisittoKalwaLoaddispatchcentre
2. Visitto substation

TextBooks:

1. JohnR.Hackworth,FrederickD.,HackworthJr.,"ProgrammableLogicControllersProgrammingMethodsandApplications", PHI Publishers.
2. JohnW.Webb,RonaldA.Reis,"ProgrammableLogicControllers:PrinciplesandApplication",PHI Learning, New Delhi, 5th Edition.

3. RonaldL.Krutz,“SecuringSCADASystem”,WileyPublications.	
4. WileyBoltan	
ReferenceBooks:	
1.BattenG.L.,“ProgrammableControllers”,McGrawHillInc.,SecondEdition	
2.GordanClark,DeemReynders,“PracticalModernSCADAProtocols”,ELSEVIER	
3.P.K.Srivstava,“ProgrammableLogicControllerswithApplications”,BPBPublications	
4. KrishnaKant,“ComputerBasedIndustrialControl”,PHI 5. CataloguesandusermanualsPLCandSCADA	
SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT -III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

IndustrialControlSystem-I		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Oral25marks	Total: 05

CoursePrerequisites:	
Thestudentsshouldhaveknowledgeof	
	Engineeringmathematics,LaplaceTransform,Testsignals, differentialequationsolution
CourseObjectives:	
1.	Constructaworkingmathematicalmodelofasystem,outlineanddeveloptransferfunctionmodelsaccordingtothe designspecificationforphysicalsystemanalysis.
2.	Makeuseoftime-domainandfrequency-domainanalysesofthemodeltoevaluatethesystem'sbehaviour.
3.	Modelthestatevariablerepresentationofphysicalsystemsandillustratetheeffectofstatefeedback.
4.	DesignPIDcontrollers.
CourseOutcomes: Afterlearningthiscoursethestudentswillbeableto	
1.	Determineandusemodelsofphysicalsystemsinformssuitableforuseintheanalysisanddesignofcontrol systems.
2.	Analyzethesystemfromthetransferfunction.
3.	Understandthetimedomainbehaviouroffirstandsecondordersystems
4.	UtilizecontrollerssuchasPIDandLead-Lagforcontroldesign.
5.	Applyvariouscontrolsystemsconceptstoanalyzeandfindthestabilityofcontrolsystems.
6.	Expressandsolvesystemequationsinstatevariableform,analyzetheobservabilityofthesysteminstate modelling.

UNITI	**Introductiontocontrolsystem**	**(08Hours)**
	Blockdiagramofcontrolsystem,industrialapplicationsofcontrolsystem,openloopandclosed loopcontrol,fundamentalsoffeedbackcontrolsystem,BlockdiagramreductionTechniques,Signal flow graph, Mason's gain formula.	
UNITII	**Modellingofelectricalsystems**	**(08Hours)**
	Translationalandrotationalmechanicalsystems,Analogyformechanicalandelectricalsystems, Potentiometer,Synchros,AC-DCServomotor,Steppermotor,GearTrains,AC-DC servomechanism,Tacho-generator, optical encoder.	
UNITIII	**TimeDomainAnalysis**	**(08Hours)**
	Transient response, steady state response, Types of test signals, Measures of performance of the standard first order and second order system, Time domain specifications, Types of test inputs, Steady state error, error constants, generalized error coefficient.	
UNITIV	**FrequencyDomainAnalysis**	**(08hours)**
	Stability-conceptanddefinition,Poles,Zeros,OrderandTypeofsystems,Routh-Hurwitztest,Root locustechnique,Bodeplot,Nyquistplot,Nyquiststabilitycriterion,gainandphasemargins, robustness,Stabilityanalysisinfrequencydomain.	
UNITV	**ControllerandCompensatorDesign**	**(08Hours)**
	IntroductiontoPIDcontroller:P,PI,PDandPIDTuningconceptofZeigler-Nicholasmethod,Need ofcompensation,transferfunctionoflead,lag,lag-lead,leadandlagcompensatordesignusingroot locus,UseofSISOdesigntoolin MATLAB.	
UNITVI	**StateSpaceAnalysis**	**(08Hours)**
	Concept of state and state variable, Modelling of systems using state variables, Coordinate transformations and canonical realizations, Solution of state variables, Controllability and observability.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.Fourfromfirstseven,fourfromnextsevenandtoensureat leastoneexperimentoneachunit.

1. Toplotcharacteristicsofpotentiometerandobservepotentiometerpairasanerrordetector.
2. TodeterminetransferfunctionofDCservomotor.
3. ToplotcharacteristicsofSynchroandobserveSynchropairasanerrordetector.
4. Toplotandanalysethetimeresponsebehaviourofsecondordersystem.
5. ToobservestepresponseofRLCseriescircuitfordifferentvaluesofR.
6. To plot root locus using MATLAB and determine value of K for given value of damping ratio from the plot. ii) To analyze effect of addition of zero/ pole on root locus
7. Toobservefrequencyresponseandtodrawbodeplotoflag,lead network.
8. Toanalyzestabilityofsysteminfrequencydomainbyi)Nyquistplotii)BodeplotusingMATLAB.
9. Tocalculatesteadystateerrorfordifferentinputsanddifferenttypesofsystem(MATLAB).
10. TosimulateanddeterminetheeffectofP,PD,PI,PIDControlleronasecondordersystems.
11. TotunePIDcontrollerandanalyzestepresponseoftemperature/pressurecontrolsystem.
12. TodesignleadcompensatorinMATLAB/Simulinkusingbodeplotandobservestepresponseofuncompensatedand compensated system.
13. To design lag compensator in MATLAB/Simulink using root locus technique and observe step response of uncompensated and compensated system.
14. StatespacemodelforclassicaltransferfunctionusingMATLAB-Verification.

ProjectBasedLearningAssignments:

1. Designanddevelopatemperaturecontrollerusing PID.
2. Developaclosedloopsimulinkmodelofdcmotordrawandthebodeplot.
3. Simulateandobtainthestepresponseofsecondordercontrolsystem.
4. FormulatethestatespacemodelforaclassicaltransferfunctionandexamineitsstabilityinMATLAB/Simulink.
5. PerformthestabilityanalysisofDCmotor.
6. Designasteppermotorcontrol.
   Design a BLDC motor control.

TextBooks:

1. N.J.NagrathandM.Gopal,"ControlSystemEngineering",NewAgeInternationalPublishers,5thEdition,2009.
2. OgataK.,ModernControlEngineering,Prentice-HallofIndiaPvtLtd.,NewDelhi,3rdedition,2000.
3. NormanS.Nise,ControlSystemsEngineering,2014,7thEdition,JohnWiley&Sons,NewJersey,USA
4. M.N.Bandopadhyay,"ControlEngineeringTheoryandpractice"-PrenticeHallofIndia2006.

ReferenceBooks:

1. Schaum'sOutlineSeries,"FeedbackandControlSystems"TataMcGraw-Hill,2007.
2. M.Gopal,"ControlSystem–PrinciplesandDesign",TataMcGrawHill,4thEdition,2012.
3. D.RoyChoudhary,"ModernControlEngineering",PHILearningPvt.Ltd.,2005

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT -III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

IndustryTaughtCourse-III:WebDesigning		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Oral:25marks	Total: 05

CoursePre-requisites:	
TheStudentsshouldhaveknowledgeof	
1.	Basicknowledgeof Computers
2.	Windows10operation
3.	MicrosoftOffice–Word,Excel,PowerPoint,Paint
4.	Onlinepurchase,netbanking

CourseObjectives:	
	1. Studentsareabletodesignthewebsite. 2. Togettheknowledgeofmodificationofwebsite. 3. Togetdetailedinsightmaintenanceofwebsite 4. Toknowtherequirementsmakingthewebsiteuserfriendly. 5. Tolearntointroduceecommerceinthewebsite.

CourseOutcomes: Afterlearningthiscoursestudentswillbeable to	
1	Designthewebsite.
2	Understanddifferentwebsitehostingcompaniesandtheirfacilities.
3	Understandtohigherspaceforstoringthedata.
4	Maintainthewebsiteanduploadtherecentdata.
5	Topurchasethedomainname.
6	

UNIT–I	**IntroductiontoWebTechnologies**	**(08Hours)**
	Designingnewwebsite,rulesofwebdesigning,designingnavigationbar,Pagedesign,homePage Layout,Creating different themes for different layouts, to create and design banners, advertisements, Learning about the tools and techniques of web design covers using software applications, Introduction to Web Technologies,Website Working, Client and Server Scripting Languages, Domains and Hosting o Responsive Web Designing, Types of Websites (Static and Dynamic Websites) Web Standards and W3C recommendations **AdobePhotoshop** Introduction of Stock Photography, Types of Image Graphics, Introduction to Adobe Photoshop, InterfaceTourofPhotoshop,ColorModes,ResolutionandPresets,MoveTool,MarqueTool,Lasso Tool, Quick Selection, Magic Wand, Crop, Slicing Tool, Healing Brush, Patch Tool, Brush Tool, History Brush, Eraser Tool, Pattern Stamp, Clone Stamp, Gradient Tool, Blur and Exposure Tool, Pen Tool, Shape Tool, Text Tool, Other Photoshop Tools,Layers, Groups and Smart Object, Blending Options, Filter Effects, Client requirement analysis, Real time Website Layout Design, Practical Task in Layout Design	
UNIT-II	**HTML4.01andXHTML1.1**	**(08Hours)**
	What is Markup Language, Basic Structure of HTML, Difference Between HTML and XHTML, HeadSectionandElementsofHeadSection,MetaTags,CssTags,ScriptTag,TableTag,DivTag, Header Tags, Paragraph, Span, Pre Tags, Anchor Links and Named Anchors, Image Tag, Object Tag,, I frame Tag, Forms, Form Tag, Attributes of Form,POST and GET Method, Field set and Legend,Text input, Text area , Checkbox and Radio Button,Dropdown, List and Opt group,File UploadandHiddenFields,Submit,Image,Normal,ResetButton,CreatingaLiveWebsiteForm, HTMLValidators	

	AdobeDreamweaver IntroductiontoAdobeDreamweaveroDreamweaverInterfaceBasics,DefiningaDreamweaversite o Insert Toolbar, Common Tools, Layout Tools,Forms Tool,Spry Tools, Properties Panel, Using Snippetspanel,Dreamweaverextensions,TemplateDesigninDW,EditableandNon-Editable Regions,DefiningtheDWTforproject.,Creatingsubpagesforproject	
UNIT-III	**CSS 2.1**	**(08Hours)**
	Introduction to Cascading Style Sheets,Types of CSS,CSS Selectors o Universal Selector,ID Selector,TagSelector,ClassSelector,SubSelector,Child CombinatorySelector,AdjacentSibling Selector o AttributeSelector oGroup selector oFirst-lineand First-letter selector,Beforeand After Selector,CSSProperties,TypeProperties,BackgroundProperties,BlockProperties,BoxProperties, ListProperties,BorderProperties,PositioningProperties,RealtimeImplementation,Conversionof Table to CSS Layout, CSS Menu Design (Horizontal, Vertical),Form Designing **HTML5** Introduction to HTML5, Features of HTML5, HTML5 Doc Type,New Structure Tags,Section, Nav, Article, Aside o Header, Footer o Designing a HTML Structure of Page,New Media Tags o Audio Tag,Video Tag, Canvas and Svg Tag, Introduction to HTML5 Forms,New Attributes, PlaceholderAttribute,RequireAttribute,PatternAttribute,AutofocusAttribute,email,tel,urltypes, number type, date type, range type, voice search,Examples of Form	
UNIT-IV	**CSS3**	**(08 Hours)**
	IntroductiontoCSS3,New CSS3Selectors,AttributeSelectors,First-of-type,Last-of-type,Nth- child, Element empty, New CSS3 Properties, Custom Fonts, Text-Shadow Property, Text-Stroke Property, Rounded Corners, Box Shadows, CSS Gradients, CSS Multiple backgrounds, Opacity Property,TransitioneffectoTransformeffect,Animationeffects,CssMediaQueries,UsingCSS3 in Practical Layout **ResponsiveWebDesignwithBootstrap** Introduction to Responsive Design, Mobile first design concepts, Common devicedimensions, View-port tag, Using css media queries, Menu conversion script,Basic Custom Layout, Introduction to Bootstrap,Installationof Bootstrap,GridSystem,Forms,Buttons,IconsIntegration,UsingCSS3 inPracticalLayout	
UNIT-V	**Java Script**	**(08Hours)**
	Introduction to Client Side Scripting o Introduction to Java Script, Java script, Types,Variables in JS, Operators in JS, Conditions Statements, Java Script Loops,JS Popup Boxes, JS Events,JS Arrays,WorkingwithArrays,JSObjects,JSFunctions,UsingJavaScriptinRealtime,Validation of Forms, Related Examples **JQueryandjQueryUI** Introduction to j Query o j Query Features, Installing j Query, j Query Syntax ,j Query Ready Function,jQuerySelectors,jQueryActions,jQueryplugins,jQueryValidationplugin,jQuery Slideshow,jQueryDropdown,jQueryUI,WorkingwithjQueryUI,jQueryAccordions,jQuery Tabs,j Query Tooltips, j Query Auto complete	
UNIT-VI	**AdobeFlash**	**(08Hours)**
	Introduction to Animation, Introduction to Adobe Flash, Tools in Adobe Flash, Shape Tween and Motion Tween, Frame Animation, Various Flash Effects, Creating Flash Banners,Creating Flash Intro's,Creating Flash Website,Basics of Action Scripting. **WebHosting** WebHostingBasics,Types ofHostingPackages, Registeringdomains,DefiningName Servers, Using Control Panel, Creating Emails in C panel , Using FTP Client,Maintaining a Website Careers in Web Technologies and Job Roles WebDesigners,WebApplicationDeveloper,WebDesignInstructor,Designconsultant,Multimedia Programmer, UX/UI Designer, Web Media Designer, Flash media designer, website programmer, multimedia specialist, game developer designer. **Sectors that employ web designers and their role-** IT companies, Start ups, internet marketing companies,websitedesigningcompanies,professionalwebsites,newschannels,gamingcompanies, educational institutes, web advertising companies, web consultants	
TermWork:		
Thetermworkshallconsistofrecordofminimumeightexperiments.		

1. One-pagelayout
2. Loginauthentication
3. Productlandingpage
4. GiphywithauniqueAPI
5. JavaScriptquizgame
6. To-dolist
7. SEO-friendlywebsite
8. JavaScriptdrawing
9. Searchengineresultpage
10. Googlehomepagelookalike
11. Tributepage
12. Surveyform
13. Exitplugin
14. Notelog
15. Socialsharebuttons
16. Toastnotifications
17. AJAX-stylelogin
18. Wordcounter
19. Countdowntimer
20. Modalpop-ups
21. Addressbook

Projectbasedlearning:

1. Purchaseadomainfromanyserviceprovider
2. Createawebsiteforonlinemarketing
3. Hireonlinespaceandstoredata
4. Getordersformakingcommercialwebsite
5. Makeanonlinestorewebsite
6. Makeacollegewebsite
7. Maleawebsiteforindustry
8. Makeawebsiteforsmall shop
9. Makeawebsiteforfarmers
10. Makeawebsiteforsellingfruitsandvegetablestables
11. Makeawebsitefororganizingaconference
12. Makeawebsiteforonlinelearning
13. Makeawebsiteforgaming

TextBooks:

1. JasonBeaird,ThePrinciplesofBeautifulWebDesign
2. JenniferNiederstRobbins,LearningWebDesign

ReferenceBooks:

1. BernhardThalheim,Klaus-DieterSchewe,"Designanddevelopmentofwebinformationsystems,Springer
2. JenniferNiederstRobbins,WebDesigninaNutshell:ADesktopQuickReference,O'ReillyMediaISBN9781449379094, 1449379095

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT -III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

VocationalCourse-IIIElectricVehicleArchitecture&Modeling

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Practical:02Hours/Week	Termwork:25Marks Oral:25Marks	Credits:01

CoursePrerequisites:

Thestudentsshouldhaveknowledgeof

	Basicelectricalprincipleandelectricaltechnology.

CourseObjectives:

	Understandingofbasicprinciples,operation,performanceofElectricvehicles

CourseOutcomes: Afterlearningthiscoursethestudentswillbeableto

1.	Tounderstandthebasicsof ElectricVehicles
2.	To understandthebasicsof HybridElectricVehicles
3.	TounderstandVehicleFundamentals
4.	Tounderstandthebasicsof Motors
5.	Tounderstandthebasicsof Converts
6.	To understandthebasicsofINDIANandGLOBALScenario

UNITI	**ElectricVehicles**	
	History, Components of Electric Vehicle, General Layout of EV, EV classification ComparisonwithInternalcombustionEngine:Technology,Advantages& Disadvantages of EV, Overview of Tesla car.	
UNITII	**HybridElectricVehicles**	
	History**,**ComponentsofHybridElectricVehicle,GeneralLayoutofHybridEV, ComparisonwithElectricVehicles,Advantages&DisadvantagesofHybridEV, OverviewofToyotaprius.	
UNITIII	**VehicleFundamentals**	
	Vehicleresistance,Types:RollingResistance,gradingresistance,Aerodynamic dragvehicleperformance,CalculatingTheAccelerationForce,maximumspeed, FindingTheTotalTractiveEffort,TorqueRequiredOnTheDriveWheel, Transmission:Differential,clutch&gearbox,Brakingperformance.	
UNITIV	**Motors**	
	PrincipleandworkingofDCmotor,CharacteristicsandTypesofDCMotors-Overview(Speedtorquecharacteristics)ofPermanentMagnetmotor,BLDC Motor, Induction motor. Comparison of all motors.	
UNITV	**Converters**	
	IntroductionofDC-DC,AC-AC,AC-DC,DC-AC,four-quadrantoperation,Drivercircuits.	
UNITVI	**INDIANandGLOBALScenario**	
	TechnologyScenario,MarketScenario,PoliciesandRegulations,Paybackandcommercial model, Payback and commercial model, Polices in India.	

Termwork: Thetermworkshallconsistofrecordofminimumeightexperiments.

List ofExperiments:

1. Studyofelectricvehiclebasics
2. StudyofvariouspartsofElectricVehicle
3. Studyofconstruction,workingprincipleofelectricvehicle
4. Studyoftypes ofmotorsusedinElectricvehicles
5. StudyofvariousbatteriesinElectricVehicle
6. StudyofvariousControllersforElectricVehicles
7. StudyofUltracapacitorsforapplicationofElectricvehicles
8. StudyofstartingkitsforElectricVehicles

9. StudyoftestingofElectricvehicles
10. StudyofdifferentmodelsofElectricvehicles

TextBooks:

1.ElectricVehicleTechnologyExplained ..... BYJohnLowryandJamesLarminie

2.ModernElectric,HybridElectric,andFuelCellVehicles:Fundamentals,Theory,andDesign…..BYMehrdadEhsaniand Yimin Gao

ReferenceBooks:

1. ElectricandHybridVehicles:Design……BYIqbalHusainFundamentals
2. BuildYourOwnElectricVehicleSeth ..... BYLeitmanand
3. IntroductiontoHybridVehicleSystemModelingandControl ..... BYWeiLiu

BharatiVidyapeethDeemedtobeUniversity,Pune
Faculty of Engineering & Technology
BoardofStudies(ElectricalEngineering)
Programme:B.TechElectricalEngineeringSem–VI(2020Course)

ProtectionofPowerSystemComponents		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04	EndSemesterExamination:60Marks	Theory:04
Practical:02	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Oral:25 Marks	Total: 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

BasicElectricalEngineering,ElectricPowerSystem, ElectricalMachines,DesignofElectricalMachines

CourseObjectives:

To develop the students to recognize and study various protection devices for various applications in Electric Power system. To design an Electric protective system with respect to safety considerations.

CourseOutcomes: Afterlearningthiscoursestudentswillbeable to

1	Describecircuitbreakersandvariousprotectioncircuits.
2	ExplainthenecessityandcomparisonbetweenElectromagneticandStaticRelays
3	IllustratethevariousTransformerprotectionschemes
4	IllustratethevariousGeneratorprotectionschemes
5	EvaluateandunderstandthevariousTransmissionline protectionschemes.
6	DesignofElectricSubstationandstudyofElectricalsoftware's.

UNIT–I	**ProtectioncircuitsandCircuitBreakers**	**(08 Hours)**
	Functionsofprotectivesystem,Normalandabnormalconditionsandtheireffectsonpowersystem, Fault-types,Causes,ShortcircuitkVAcalculations,andCurrent limiting reactors. Essential qualities of protections,Circuit Breakers: Elementary principles of arc interruption, Recovery,RestrikingVoltageandRecoveryvoltages. -RestrikingPhenomenon,AverageandMax. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Auto reclosures. Construction, working & application of low tension switchgear - Fuses, Isolators, MCB, MCCB, ELCB,Contactor,	
UNIT-II	**ElectromagneticandStaticRelays**	**(08 Hours)**
	Principle of Operation and Construction of Attracted armature-Balanced Beam, induction Disc and Induction Cup relays. Relays Classification: Instantaneous, DMT and IDMT types. Application of relays:Overcurrent/undervoltagerelays,Microprocessorbasedrelays-Directionrelays,Differential Relays,PercentageDifferentialrelays-UniversalTorqueEquation-DistanceRelays:Impedance Relay-Reactance Mho Relay-Off-set Mho Relays-Characteristics of Distance Relays and Comparison-Static Relays verses Electromagnetic Relays.	
UNIT-III	**TransformerandInductionmotorprotection**	**(08 Hours)**
	Types of Faults, Over Current Protection, Percentage Differential Protection, Inrush Phenomenon, High Resistance Ground Faults in Transformers, Inter-turn Faults, Incipient Faults, Over-fluxing Phenomenon, Buchholz's relay protection. Faults and Abnormabilities in induction Motor, starting of Induction Motor, Merz Price protection scheme	
UNIT-IV	**GeneratorProtection**	**(08 Hours)**
	ProtectionSchemesProvidedforGenerators–Statorside(Differential,RestrictedEarthfault, protectionfor100%winding, Negative phase sequence, Reverse power, turn-turnfault), Rotor side (Fieldsuppression,fieldfailure,Earthfault,turntoturnfault).Protectionofmotoragainstoverload,	

	shortcircuit,earthfault,singlephasing,unbalance,lockedrotor,phasereversal,undervoltage, winding temperature. -Numerical Problems on % Winding Unprotected	
UNIT-V	**OverVoltageandTransmissionLineProtection**	**(08 Hours)**
	GenerationofOverVoltagesinPowerSystems.-ProtectionagainstLightningOverVoltages-Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time characteristics. Introduction to Distance Protection, Types of DistanceRelay,Impedance,Reactance,MHORelay,PerformanceofDistanceRelayDuringNormal LoadandPowerSwing,EffectofArcResistanceonReachofDistanceRelays,Comparisonof DistanceRelays,DistanceProtectionofTransmissionline,PilotwireScheme.	
UNIT-VI	**ElectricalSubstationandNeutralEarthing**	**(08 Hours)**
	Substation Equipment and switching devices Substation Equipment: Switchgear-Definition, Types, Location of switchgear in typical power system Switching Devices:- Isolator & Earthing switch (Requirements & definitions, types and construction, Pantograph Isolators, Ratings), Contactors: Basicworkingprinciple,Terms&Definitions,contactorsasstartersformotors,ratedcharacteristics/ Utilization categories of contactors. Neutral earthing, its necessity and significance.	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

1. TofindthecharacteristicsofMCBusingrelaytesting kit.
2. TofindthecharacteristicsofMCCBusingrelaytesting kit.
3. Tofindthepickupanddropoffvoltageof Contactor
4. TofindthecharacteristicsofInductiontypeovercurrentrelay
5. TofindthecharacteristicsofInductiontypeundervoltagerelay
6. Tofindthecharacteristicsofmicroprocessorbasedovercurrentrelay
7. Tofindthecharacteristicsofmicroprocessorbasedundervoltagerelay
8. Tofindthecharacteristicsofmicroprocessorbasedovervoltagerelay
9. Transmissionlineprotection
10. Reportonindustrialvisittoswitchgeartrainingcentre/orswitchgear/relaymanufacturingunit/orH.T.substationvisit.

Projectbasedlearning:

1. RelayCo-ordinationinsimulationsoftware
2. DesignofseriesReactorinsimulationsoftware.
3. Designandselectionofcircuitbreakers.
4. Transformerprotectionschemeinelectricalsoftwares.
5. ProtectionofPowersystemcomponents.
6. StudyofPanelboardusedindistributedsystem.
7. DesignofNumericalrelaysinsimulationsoftwares.

TextBooks:

3. SwitchgearandProtection –bySunilSRao,KhannaPublishers.
4. PowerSystemProtectionandSwitchgearbyBadariRam,D.NViswakarma,TMHPublications
5. SwitchgearandProtection-ByShripadDesaiandDrDeepakBankar,TechNeoPublications

ReferenceBooks:

1. FundamentalsofprotectionbyPaithanker&Bhide.S.R
2. StaticRelaysbyMadhavaRao
3. AtextbookonPowerSystemEngineeringby Soni
4. ProtectiveRelayingbyLewisBlackburn
5. PowerSystemProtectionbyP.M.Anderson
6. ElectricalPowerSystemsbyV.K.Mehta,Volume-II.

SyllabusforUnitTest:

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

IndustrialControlSystem-II		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:04
Tutorial:01Hours/Week	ContinuousAssessment:40Marks	Practical:01
Practical:02Hours/Week	TermWork:25Marks Oral25marks	Total: 05

CoursePrerequisites:		
Thestudentsshouldhaveknowledgeof		
	LinearControlSystem,MethodsofStabilityAnalysis,MatrixAlgebra	
CourseObjectives:		
	Thiscourse introducesstate space modelling and stability analysisof system. Itincludesphase plane and describing functionmethodofstabilityanalysisofnonlinearsystem.Italso,introducesfundamentalmathematicalconceptsand stability analysis of digital control system and adaptive control systems.	
CourseOutcomes: Afterlearningthiscoursethestudentswillbeableto		
1.	Representthesystemequationinvariousstatespacemodels(physical,phaseandcanonicalvariables)	
2.	Draw block diagram and signal flow graph from state space model of system. Calculate the solution of state equation; calculate transfer function from state space model.	
3.	Recognizevariousnonlinearitiesanditseffectonsystemstability.PrincipleandoperationsofDescribeFunctionwithits merits and demerits.	
4.	Compare between Linear and nonlinear, analog and digital, state space and transfer function model, Z-transform andInverse Z-transform	
5.	Calculatepulsetransferfunctionofdigitalsystem.Explainthemathematicalmodelofdigitalsystemandselect appropriate sampling frequency.	
6.	Applicationsofadaptivecontrol,robustcontrol,ArtificialneuralnetworkandFuzzylogic	
UNITI	**StateVariableRepresentation**	**(08Hours)**
	Comparison of Transfer Functionand State Variable Analysis, Concept of State, State Space, State Vector, State Equation, Output Equation, State Space Representation Using: Physical Variable, Phase Variable andCanonical Variables with Block Diagram, Decomposition of Transfer Function, Eigen Values and Eigen Vectors, Diagonalization of the System Matrix with Distinct & Repeated Eigen values.	
UNITII	**StateVariableAnalysisandDesign**	**(08Hours)**
	SolutionofStateEquation,StateTransitionMatrix(STM),MethodstoDetermineSTM:InfiniteSeries Method, Laplace Transform, Caley Hamilton Theorem. Definition of Controllability, Observability, Kalman'sTest,Gilbert'sTest,Determinationof TransferFunctionsfromStateModel.StateFeedback Control,Pole Placement Design through State Feedback	
UNITIII	**Nonlinearsystem**	**(08Hours)**
	Introduction,Classification,PeculiarBehaviourofNonlinearSystem:Sub-Harmonics Response,JumpResonance,LimitCycle:StableandUnstable,AmplitudeasFunctionofFrequency Oscillation, Non-linear Spring Mass System, Sub-Harmonic Oscillation, Asynchronous Quenching, Frequency Phase Plane Method, Singular Points, Phase Plane Plots usingDelta Method Determination Stability from State Trajectory, Relation with Time Domain Analysis. Concept ofDescribing Function, Derivation of DescribingFunction ofVarious non- linear Elements,StabilityAnalysisusingDescribingFunction,ExistenceofLimitCycle,Meritsand Demerits of Describing Function Method	
UNITIV	**Discretetimesystem**	**(08Hours)**
	Basic Elements of Discrete Data System, Merits of Discrete System, Sampling and Selection of SamplingPeriod,SampleandHoldCircuit,A/DandD/AConverter,ModellingofZeroOrder Hold,Reconstruction of Signals from Samples, Shannon's Sampling Theorem. Z-Transform: Definition, Simple Functions, Inverse Z-transform, Linear Difference Equations and Solutions	
UNITV	**AnalysisofDiscretetimesystem**	**(08Hours)**
	Derivation ofPulse Transfer function, Pulse Transfer Function of Closed Loop System, Bilinear Transformation, Stability in Z-Plane,Jury's Test, Routh's Criteria, State Space Representation of Discrete Time Systems, State Space Models from Pulse Transfer Function.	
UNITVI	**Introductiontoadvancesincontrolsystem**	**(08Hours)**

	Adaptive Control, Model Reference Adaptive Control Block Diagram and Working With Practical Applications, Robust Control, Fuzzy Logic, Artificial Neural Network Algorithm and Learning Architecture	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.Toensurethatatleastoneexperimentoneachunit.

1. Toconverttransferfunctionintostatemodeli)phasevariableformii)canonicalform
2. To derive state model of DC servo motor from physical variables and observe step response, i.e. to solve state equation of DCservo motor
3. TodetermineEigenvalues,Eigenvectorsanddiagonalisethesystem.
4. Todeterminecontrollabilityandobservabilitybykalman'stestandGilbert'stest.
5. Designofstatefeedbackgainmatrixbypoleplacement.
6. Toplotphaseplanetrajectoryofsystemwithnonlinearelementsusing SIMULINK.
7. Toanalyzestabilityofnonlinearsystemusingdescribingfunction.
8. Toconvertcontinuoustimesystemtodiscretetimesystemandtoobserveeffectofsamplingtimeonstepresponse.
9. Todeterminethegainforstabilityin Z domain.
10. TostudyadaptivecontrolandrobustcontrolapplicationswithMATLABdemos.

ProjectBasedLearningAssignments:

1. ANNbasedClassificationusingMATLAB.
2. Fuzzylogicbasedwashingmachineautomation.
3. Designandevaluatedperformanceofasystembyinsertingnonlinearitiestothesystem.
4. HandGestureRecognitionusingMATLAB
5. Vehiclenumberplaterecognition
6. AutomaticcertificategenerationusingMATLAB.

TextBooks:

1. I.J.Nagrath,M.Gopal,""ControlSystemEngineering",NewAgeInternationalPublishers–Fourthedition
2. KatsuhikoOgata,"Digitalcontrolsystem",PrenticeHall,2010.
3. M.Gopal,"Digitalcontrolsystem"
4. DorfandBishop,"ModernControlsystems"-Pearsoneducation

ReferenceBooks:

1. NiseN.S."ControlSystemsEngineering",JohnWiley&Sons,Incorporated,2011
2. D.RoyChoudhary,"ModernControlEngineering",PHILearningPvt.Ltd.,2005
3. GeirE.Dullered,F.G.Paganini-"Acourseinrobustcontroltheory"-Springer
4. JanJantzen-'FoundationofFuzzycontrol –apracticalapproach–Wiley

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT -III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

PowerSystemModeling&Analysis

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Practical:25Marks	Total: 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	StructureofPowerSystem,Transmission&DistributionSystems,NetworkAnalysis.

CourseObjectives:

Thiscourseaimsatunderstandingthecomponentsofinterconnectedpowersystem,Representationofthesesystemcomponents intermsofmathematicalmodelsandToolsforanalyzingthesystemoperationduringthenormal&abnormaloperating conditions.

CourseOutcomes:

1.	ToapplytheconceptsofComplexPower.
2.	TointerpretSingleLineDiagramofpowersystems&modelthepowersysteminper unit
3.	Toformulatetheloadflowproblemfor3-4bussystem&interpretttheresults.
4	Tocomputefaultcurrentontheoccurrenceofsymmetricalfaultonpowersystem
5	Tocoverttheunbalancedsystemparameterstosequencecomponents&viceaversa&tocomputefaultcurrentonthe occurrence of SLG,LL and DLG fault on power system
6	TodescribeswingEquation&applysolutiontounderstandtherotordynamicsofsynchronousmachines

UNIT-I	**ComplexPower**	**(08Hours)**
	Structure of Interconnected & Integrated Power System, Formation of National Grid, Present Indian Power Industry, Power system analysis and their necessity. Concept of complex power , Complex power flow through transmission lines, Load on thesystem, its composition, nature of load curves for various consumer categories, Load voltage-frequency specifications & permissible variations, Real power-frequencyandreactivepower-voltagedependency,Conventionalmethodsofvoltagecontrolof Powersystem.	
UNIT-II	**PowerSystemModeling**	**(08Hours)**
	Representation of power system-Single line diagram, Representation and modeling of short, medium andlongline,Introductiontosynchronousmachine,Synchronousgenerator-simplemodelsuchasemf behind reactance, power transformer, Two winding transformer and three winding transformer. Impendence and Reactance diagrams of power systems and their use. Theperunitsystemofparametervaluerepresentation-selectionofbase,changeofbase,advantages,its application to impendence/reactance diagram.	
UNIT-III	**LoadFlowAnalysis**	**(08Hours)**
	Development of mathematical models of simple systems by network reduction, Driving point & Transfer Admittance, Concept of Z-bus and Y-bus matrices,Formation of Y Bus Matrix ,Introduction to load flow analysis, Classification of buses, Formation of power flow equations (PFES) for n bus powersystem,Classificationofvariables&solutiontechniques,Newton-RaphsonMethod(Polarform) forloadflowsolution,Introductiontooptimalpowerflowand DCpowerflow,itsimportance,necessity and difference from conventional power flow (Numerical).	
UNIT-IV	**SymmetricalFaultAnalysis**	**(08Hours)**
	Symmetrical faults on power system, Sudden three phase short circuit fault on unloaded alternator, Transient on a transmission line, DC offset and effect of the instant of short circuit on the waveforms, Estimation of fault currents with and without pre-fault current for simple power system, Selection of circuit breaker, Short circuit MVA ,Selection of current limiting reactors.(Numerical)	
UNIT-V	**UnsymmetricalFaultAnalysis**	**(08Hours)**
	Unsymmetrical faults on power system, Introduction to symmetrical components, Methods of symmetrical components, relationships, sequence impedances. Representation of power systems by positive, negative and zero sequence networks, Nature of sequence impedance of power system components. Symmetricalcomponentanalysisofunsymmetricalfaults: Line-Line,Line-Ground,Line-Line-Ground faults,Analysisofunloadedandpreloadedalternatorsandsimplepowersystemswithandwithoutfault impedance.	

UNIT-VI	PowerSystemStability	(08Hours)
	Concept of steady state, dynamic and transient stability of power systems and the factors controlling each, Steady state stability, its evaluation and variation of limits of stability under system conditions, Transientstabilityandimportanceofrotatingmachinedynamicsinthepowersystemstability evaluation, The swing equitation, its derivation, Equal Area Criteria (Consideration of one machine-infinite bus problem only.)	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

1. StudyofeffectofVARcompensationonreceivingendvoltageprofileonatransmissionlineusingcapacitorbank.
2. Determinationofsteadystatestabilitylimitfortransmissionline.
3. Determinationofsteadystatelimitofasynchronousmotorandplotting P-δcurve.
4. Measurementofsubtransientreactanceofasalientpolesynchronousmachinebystaticimpedancemethod.
5. Measurementofnegativesequencereactanceofsynchronousmachine.
6. Measurementofzerosequencereactanceofsynchronousmachine.
7. Faultanalysisforsymmetricalfaultbysimulationor AC/DCnetworkanalyzer.
8. Computeraidedsolutionofloadflowproblemusing Newton-Raphsonmethod.
9. FormationofYbusmatrixusingcomputerprogramming.
10. Studyofloadflowon3bussystemusingbyactualsimulation/ACnetworkanalyzer.
11. Demonstrationoftransmissionlineperformancebytransmissionlinesimulationpanel.
12. StudyofEqualAreaCriterionbyusingprofessionalsoftware.

Projectbasedlearning:

1. Student shall demonstrate minimum one concept from the syllabus by using hardware model or professional software (ETAP/MATLAB/ANSYS Maxwell etc.)
2. Refertheofficialwebsites&preparereportonPowerScenarioofIndiaMinistryofPower,CERC,MNRE.
3. Sketch the load curves for Residential, Industrial, Agriculture, Municipal and Commercial categories of consumers and compare them with reference to Load factor, Diversity factor. Also plot the monthly load curve of the college substation. Estimate the maximum demand, Load factor.
4. Sketch the single line diagram (SLD) of the college & department power supply system. Enter all the specifications of the power system components & develop SLD using the ETAP software.
5. Developthepowersystemmodelofthedepartment/Collegepowersystem/anyotherpowersystem(upto50buses)&conduct the load flow analysis using ETAP software. Analyse the results using N-R method.
6. Developthepowersystemmodelofthedepartment/Collegepowersystem/anyotherpowersystem(upto50buses)&conduct the short circuit analysis using E TAP software. Analyse the results to confirm the Circuit Breaker ratings.
7. Develop the model of long transmission line and synchronous machine & estimate the steady state stability limit using ETAP/MATLAB software.
8. ArrangeIndustrialVisittoLoadDispatchCenter:Preparestudyreportoncontrolfunctionsappliedbytheloaddispatcherfor Power System Analysis

TextBooks:

1. IJNagrath,DPKothari,"ModernPowerSystemAnalysis",TataMcGrawHillPublication
2. GraingerJhonJ,WDStevensonJr,"PowerSystemAnalysis"Mc-GrawHillPublication

ReferenceBooks:

1. OIElgerd,"ElectricalEnergySystemsTheory:AnIntroduction",TataMcGrawHillPublication
2. HadiSadat,"PowerSysemAnalysis",McGrawHillInternationalPublication
3. ARBergenandVijayVittal,"PowerSystemAnalysis",PearsonEducationAsia.
4. JDGloverandMSarma,"PowerSystemAnalysis&Design",

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT -III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

QuantitativeTechniques,CommunicationandValues

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS:**
Theory:04Hours/Week	SemesterEndExamination:60Marks Internal Assessment: 40 Marks	Credits:4

CoursePre-requisites: Thestudentsshouldhaveknowledgeof

1	Basicmath'sandreasoning,andcomprehensiveability
2	Basicknowledgeofcommunicationprocess,softskills
3	Basicknowledgeandideaaboutleadersandleadershipqualities,ethics,etiquettesandvalues

CourseObjective:

The**QuantitativeTechniques,CommunicationandValues** aimstoaugmentstudentstofacethecampusrecruitmenttestand train them on applying short techniques/ tricks to solvequestions of Maths, reasoning andEnglish in very lessamount oftime. Thecommunicationandvaluessectionfocusesontheaspectsofcommunicationandsoftskillssuchasgroomingpersonality for leading team,presentation,businesscommunication which would enablegraduatestoprojectthemselvesasaprofessionals in the corporate sector and/or otherwise.

CourseOutcomes: Thestudentwillbeableto

1	Solvetheaptitudetestintherecruitmentandcompetitiveexambyapplyingshorttechniquesandsolvethequestioninless amount of time
2	Applytheshortmnemonicsandtechniquestosolvethequestionsoflogicalreasoning intheplacementandcompetitiveexam in lesser time.
3	Developtheverbalabilitytocommunicateeffectivelyusingsuitablevocabularyandpropersentencepattern
4	Understandtheconceptofsoftskillsanditsimplicationatworkplace
5	Builduptheabilitytostudyemploymentbusinesscorrespondencesanditsproperimplications
6	Understandbusinessethics,etiquettesandvaluesandapplythemintheprofessionalventures.

CourseContent:

Unit-I	**QUANTITATIVEAPTITUDE**:Numbersystem,Percentage,profitandloss,SimpleInterestand CompoundInterest,Ratio,ProportionandAverage,MixtureandAllegation,Time,Speed&Distance, Time&Work,Permutation&Combination,Probability,PipesandCisterns	**(8Hrs)**
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.	**(8Hrs)**
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	**(8Hrs)**
Unit-IV	**SELFAWARENESSANDSOFTSKILLSDEVELOPMENT:** Concept ofSWOT, Importance of SWOT,Individual & Organizational SWOT Analysis, Soft skills, meaning,needandimportance,differencebetweensoftskillsandhardskills,lifeskillsandpersonalskills, Leadershipskills,-Importance,Types,AttributesofgoodleaderMotivationaltheoriesandleadership ,Emotional intelligence in personal and professional lives its importance need and application, Team BuildingandconflictresolutionSkills,Problemsolvingskills,TimeManagementandStressManagement Skills Pareto Principle(80/20) Rule in time management, Time management matrix, creativityandresultorientation,workingunderpressure,stressmanagement	**(8Hrs)**
Unit-V	**COMMUNICATIONANDHONINGEMPLOYMENTSKILLS:** Communication process, Non-verbal codes in communication, importance of LSRW in communication, Barriers to communication, Principles of effectiveTechnical writing, Email writing and Netiquettes, **Letter writing** – formal letters, job application letter, cover letter, structure of technical report writing, BuildingResumeandCV,TipstobuildaneffectiveResumeGroupdiscussion,SkillsrequiredforGroup DiscussionInterviewskills,WaysofhandlingtelephonicinterviewsImportanceofbodylanguage, grooming &etiquettes for getting right impression in PI&GD , Extempore, Introduction to PowerPoint presentation, ,Structure & flow of presentation,	**(8Hrs)**

Unit-VI	**BUSINESSETHICS,ETIQUETTESANDVALUES:** The Importance of Ethics and Values in Business World, Respect for Individuality and diversity at workplacevaluesofagoodmanagerKeyfeaturesofcorporateetiquette,Corporategrooming&dressing, etiquettes insocial&officeSetting-Understandtheimportanceofprofessionalbehaviouratttheworkplace, Corporatesocialresponsibility(CSR)itsimportanceandneed.		**(8Hrs)**
InternalAssessment:			
	UnitTest-1	UNIT–I,II,III	
	UnitTest-2	UNIT–IV,V,VI	
ReferenceBooks:			
1	QuantitativeAptitudebyR.S.AgarwalpublishedbyS.Chand		
2	TheBookofNumbersbyShakuntala Devi		
3	AModernApproachToLogicalReasoningbyR.S.AgarwalpublishedbyS.Chand		
4	ANewApproachtoReasoningVerbal&Non-VerbalbyInduSijwali		
5	BusinessCommunicationbyMeenakshiRaman,PrakashSinghpublishedbyOxfordUniversitypress,secondedition		
6	CommunicationSkillsbySanjayKumar,PushpLata,publishedbyOxfordUniversitypress,secondedition		
7	TechnicalCommunicationbyMeenakshiRaman,SangeetaSharmapublishedbyOxfordUniversitypress		
8	DevelopingCommunicationSkillsbyKrishnaMohan,MeeraBanerjipublishedbyMacmillanIndiaPvt Ltd		
9	SoftSkillsbyMeenkashiRaman,publishedbyCengagepublishers		
10	SoftSkillsbyDr.KAlexpublishedbyOxfordUniversitypress		
11	SoftskillsforManagersbyDr.T.KalyanaChakravarthiandDr.T.LathaChakravarthipublishedbybiztantra		
ProjectBasedLearningTopics:			
1	PreparemockTestsonUnit –Iandsolveitingiventime(useofPSDlabmanual)		
2	PreparemockTestsonUnit–Iandsolveitingiventime(useofPSDlabmanual)		
3	PrepareonlinemodeltestbasedonUnit-IIandsolveitinspecifictime(useofPSDlab manual)		
4	PrepareonlinemodeltestbasedonUnit-IIandsolveitinspecifictime(useofPSDlab manual)		
5	Formamodelforspokenandwrittencommunicationskillswhichavoidgrammarmistakesandcommonerrors		
6	Developvariousactivitymodelsforenrichinganddevelopingvocabulary		
7	PreparingstrategiesbyusingSWOTandTWOSanalysis		
8	AnalysingdifferencesbetweenSoftSkills,Hardskills,andPersonalskills		
9	DevelopBruceTuchman'sTeamBuildingModelswithclassmates/Teammates		
10	TostudydifferentpersonalitiesofLeadersfromvarioussectorsandfindouttheirattributesandsuccessstories		
11	Preparing a modelfor TimeManagementSkillsand Stress Managementand conductactivitiesfor effectiveimplementation of it.		
12	FormamodeltodevelopLSRWandcommunicationSkills		
13	ConductmockinterviewandpracticeGDactivitiestobuildcompetenciesforactualselection process		
14	PreparingamodelforevaluatingValuesandEthicsofGoodManagers		
15	PreparingamodelofdresscodesandattirefordifferentprofessionalsituationsCorporateetiquettesanditsimplications		
16	Developsomegoodactivitiestounderstandtheimportanceandneedof CorporatesocialresponsibilityCSR)		

IndustryTaughtCourse-IV:IlluminationEngineering

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04Hours/Week	EndSemesterExamination:60Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25Marks&Oral:25Marks	Total: 05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	FundamentalsofElectricalEngineering
2.	Thegenerationoflightandphysicsoflightmustbeknown.
3.	Theworkingoftheconventionallampsmustbeknown.
4.	Thetechniquesfornaturalandartificiallightingmustbeknown.

CourseObjectives:

6. Studentsareintroducedtolightingfundamentals.
7. Togetthedetailedinformationaboutmodernlampsandtheiraccessories.
8. Togetdetailedinsightofindoorandoutdoorilluminationsystemcomponents,itscontrols and design aspects.
9. Toknowtherequirementsofenergyefficientlighting.
10. Tointroducethemoderntrendsinthelighting.

CourseOutcomes: Afterlearningthiscoursestudentswillbeable to

1	LearnimportanceoflightinginHumanlife.
2	Understanddifferentlightingsources.
3	Understandelectricalcontroloflightingsources.
4	Designindoorandspecialilluminationscheme.
5	Designofoutdoorilluminationscheme.
6	Learnmoderntrendsinillumination.

UNIT–I	**ImportanceofLightinginHumanLife:**	**(08Hours)**
	Opticalsystemsofhumaneye,Dependenceofhumanactivitiesonlight,performancecharacteristics of human visual system, External factors of vision-visual acuity, contrast, sensitivity, time illuminance,colour,visualperception,opticalradiationhazards,Goodandbadeffectsoflighting& perfect level of illumination, Artificial lighting as substitute to natural light, Ability to control natural light, Productionoflight,physicsofgenerationoflight,Propertiesoflight,Quantification&Measurement of Light.	
UNIT-II	**LightSources:**	**(08Hours)**
	Lamp materials: Filament, glass, ceramics, gases, phosphors and other metals and non-metals. DischargeLamps:TheoryofgasDischargephenomena,lampdesignconsiderations,characteristics of low and high mercury and Sodium vapour lamps, Low Vapour Pressure discharge lamps – Mercury Vapour lamp, Fluorescent Lamp, Compact Fluorescent Lamp (CFL), High Vapour Pressure discharge lamps - Mercury Vapour lamp, Sodium Vapour lamp, Metal halide Lamps, SolidSodiumArgonNeonlamps,SOXlamps,Electroluminescentlamps,Inductionlamps.	
UNIT-III	**ElectricalControlofLightSources:**	**(08Hours)**
	Ballast, ignitors and dimmers for different types of lamps, PhotometricControlofLightSourcesandtheirQuantification: TypesofLuminaries,factorstobe consideredfordesigningluminaries Types of lighting fixtures. Optical control schemes, design procedure ofreflecting and refracting type of luminaries. Lighting Fixture types, use of reflectorsand refractors, physical protection of lightingfixtures,typesoflightingfixturesaccordingtoinstallationtype,typesoflightingfixtures according to photometric usages, luminaries standard (IEC-598-Part I).	

UNIT-IV	**IndoorilluminationdesignandSpecialpurposelightingschemes**	**(08Hours)**
	Zonal cavity method for general lighting design, determination for zonal cavities and different shapedceilingsusingCOU(coefficientofutilization),beamanglesandpolardiagrams.Factorsto be considered for design of indoor illumination scheme **Indoorilluminationdesignforfollowinginstallations** · Residential(Numerical) · Educationalinstitute · Commercialinstallation · Hospitals · Industriallighting **Specialpurposelightingschemes** · Decorativelighting · Theatrelighting · Aquarium,swimmingpoollighting	
UNIT-V	**Factorstobeconsideredfordesignofoutdoorilluminationscheme**	**(08Hours)**
	OutdoorLightingDesign: RoadclassificationsaccordingtoBIS,polearrangement,terminology, lamp and luminaire selection, different design procedures, beam lumen method, point by point method, isolux diagram, problems on point by point method. **Outdoorilluminationdesignforfollowinginstallations** · Roadlighting(Numerical) · Floodlighting(Numerical) · Stadiumandsportscomplex · Lightingforadvertisement/hoardings **Lightpollution** Definitionoflightpollution,lightpollutioninvariouscountries,typesoflightpollution,Light trespass,over illumination, glare, light clutter, illumination from satellites, artificial moon Effect of lightpollution on human health, ecosystem, effect on astronomy Ways to reduce light pollution, improving light fixtures, changing types of light sources, redesigninglightingplans,darkskypreserve,flickervertigo,internationaldarkskyassociation, photosensitiveepilepsy,polarizedlightpollution,scotobiology,skyglow,commissionfordark skies	
UNIT-VI	**Moderntrendsinillumination**	**(08Hours)**
	Internet of things in lighting, wireless lighting, technology,built in light, Light Fidelity LiFi technology, healthy lighting technology, lighting power technology, Human-centric Lighting, Horticulture lighting, acqua culture lighting, LED lighting comfortable for eyes, non traditional shapedLEDbulbs,poweroverethernetlighting, Reverse-wiredLEDcooling,LEDmaterial,smart LED bulbs, light for unconventional spaces LED luminary designs · IntelligentLEDfixtures · Naturallightconduiting · Organiclightingsystem · LASERS,characteristics,featuresandapplications,non-lightinglamps · Opticalfiber,itsconstructionasalightguide,featuresandapplications	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments.

1. Studyofcommercialcatalog forLEDs,CFLsandTubesforunderstandinglumensoutputandwattagesofeachlamps.
2. StudyofDesignandassemblevariousIlluminatinglamps.
3. StudyofDesignofilluminationforHotel.
4. StudyofDesignofilluminationforresidentialsector
5. StudyofDesignofilluminationforofficedepartmentalstores.
6. StudyofDesignofilluminationforHospital.
7. StudyofDesignofSolarLightingforCollege.

11.StudyofDesignofEnergyefficientlighting

Projectbasedlearning:

1. Maketubelightwiring
2. StudyofcommercialcatalogforLEDs,CFLsandTubesforunderstandinglumensoutputandwattagesofeachlamps.
3. DesignandassemblyofvariousIlluminatinglamps.
4. DesignilluminationsystemforHotel.
5. Designillluminationforresidentialsector
6. Designofillluminationsystemforofficedepartmentalstores.
7. DesignofilluminationforHospital.
8. DesignSolarLightingsystemforCollege.
9. DesignofEnergyefficientlightingsystem
10. Visittolampmanufacturingcompany
11. Casestudyofamallandwritingprojectreport
12. Casestudyoflightingsystemofanyon road
13. Casestudyoflightingsystemofairplane
14. Casestudyoflightingsystemofabus
15. Casestudyoflightingsystemofacar
16. Casestudyoflightingsystemofaship
17. Casestudyoflightingsystemofahelicopter
18. Casestudyoflightingsystemofapoultryfarm
19. Casestudyoflightingsystemofacollege
20. Casestudyoflightingsystemofanindustry
21. Casestudyoflightingsystemofaplayground
22. Casestudyoflightingsystemofaswimmingpool
23. Casestudyoflightingsystemofaindoorgamehall

TextBooks:

6. H.S.Mamak,"BookonLighting",PublisherInternationallightingAcademy
2. JosephB.Murdoch,"IlluminationEngineeringfromEdison'sLamptoLasers"Publisher -York,PA: Visions Communications
3. M.A.Cayless,A.M.Marsden,"LampsandLighting",Publisher-Butterworth-Heinemann (ISBN 978-0- 415-50308-2).
4. Designingwithlight:LightingHandbook.,AnilValia;LightingSystem 2002

ReferenceBooks:

3. "BIS,IECStandardsforLamps,LightingFixturesandLighting",ManakBhavan,NewDelhi
4. D.C.Pritchard,"Lighting",4thEdition,LongmanScientificandTechnical,ISBN0-582-23422-0.
3. "IESLightingHandbook",(ReferenceVolume1984),IlluminatingEngineeringSocietyof North America.
4. "IESLightingHandbook",(ApplicationVolume1987),IlluminatingEngineeringSocietyof North America
5. IESNAlightingHandbook.,IlluminatingEngineeringSocietyofNorthAmerica9thedition 2000
6. AppliedIlluminationEngineering,JackL.LindseyFIES(Author),ScottC.DunningPHDPE CEM (Author) ,ISBN-13: 978-0824748098 ISBN-10: 0824748093, 3rd Edition.
7. IS3646:PartI:1992,Codeofpracticeforinteriorillumination.
8. OrganicLightEmittingDiodes(OLEDs):Materials,DevicesandApplications,AlastairBuckley, University of Sheffieid, UK, ISBN: 978-0-85709-425-4.

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT -III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

VocationalCourse-IVMaintenanceofLTSwitchgear

TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**Credits**
Practical:02Hours/Week	TermWork:25Marks Oral:25Marks	Total:01

CoursePre-requisites:

Studentsshouldhavebasicknowledgeoffundamentalsofelectricalengineering.PowerSystemEngineering,Switchgear&Protection.

CourseObjectives:

Tounderstand,bestmaintenancepracticeinLVswitchgear.

CourseOutcomes:

Thestudentswillbeableto

1.	Learnelectricalbasics&contactors.
2.	Understandrelays&breakers.
3.	DescribeDOLstarter
4.	LearnaboutIP&VFD
5.	Understandelectricalmaintenance.
6.	StudyofAPFCPanel.

Topicscovered

UNIT-I	**ElectricalBasics,Contactors**	
	Involving AC Principles, Electrical symbols used in industries, 1Phase & 3Phase, How to ReadDrawing.DifferenttypesofContactors,OverLoadRelays,NO-NCAuxiliaryContacts, Timers, Push Buttons, Current Transformers.	
UNIT-II	**Relays&Breakers**	
	Under Voltage Relay, Over Voltage Relay, Phase Failure Relay, Earth Leakage Relay.Air CircuitBreakersACB,MoldedCaseCircuitBreakerMCCB,MPCB,MCB,SwitchFuseUnit SFU Selection of these Switchgears.	
UNIT-III	**DOLStarter**	
	IntroductiontoDirectOnlineStartingofMotorControlCircuit,PowerCircuit,Troubleshooting, Selection of Components.	
UNIT-IV	**IngressProtection(IP)& VFD**	
	SelectionWire,Cable,Lugs,Glands VFD – Variable Frequency Drive	
UNIT-V	**ElectricalMaintenance**	
	1. ReactiveMaintenance 2. PreventiveMaintenance 3. PredictiveMaintenanceThermo-GraphicAnalysis	
UNIT-VI	**APFCPANELS**	
	ConstructionOfAutomaticPowerFactorCorrectionPanels,PowerFactor	

ListofPracticalstobeperformedinthelaboratory:

1.	PracticalSessionofSemiAutomaticStarDelta.
2.	PracticalSessionofFullyAutomaticStarDelta
3.	PracticalSessionofRemoteOn&Off ofMotor,Control&PowerWiring.
4.	PracticalSessionofForwardReverse.

5.	PracticalSessionofThreeStepSlippringStarter
6.	PracticalSessionofFourStepSlippringStarter
7.	CrusherCaseStudyPracticalSequentialOperationofMotors
8.	ConstrictionforSLD&GADrawing
Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabove list	
ReferenceBooks:	
1.	FundamentalsofPowerSystemProtection,PaithankarY.G.andBhideS.R, PHI, New Delhi (Latest Edition).
2.	PowerSystemProtectionandSwitchgear,Ram BandVishwakarmaD.N.,TMH,NewDelhi (Latest Edition)
3.	SwitchgearandProtection,RaoS.S.,KhannaPublications,NewDelhi(LatestEdition)
4.	SwitchgearandProtection,GuptaJ.B.,Katariya Pub.NewDelhi(LatestEdition)
5.	PowersystemProtectionandSwitchgear,RavindranathB.andM.Chander,WileyEasternLtd,Delhi.(LatestEdition)
6.	ArtandScienceofProtectiverelaying,Wadhwa.C.L.,C.R.Mason,JohnWiley,NewDelhi.

BharatiVidyapeethDeemedtobeUniversity,Pune Faculty of Engineering & Technology
Programme:B.Tech(Electrical&ComputerEngineering)Sem–VII(2021Course)

PowerSystemStability&Control

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITS ALLOTTED:
Theory:03Hours/ Week	EndSemester Examination:60 Marks	Theory04
Practical:02Hours/Week	InternalAssessment:40 Marks	Practical01
Tutorial:01 Hours/Week	TW: 25Marks Oral:25 Marks	Total05

CoursePre-requisites:

Thestudents shouldhaveknowledgeof

1.	BasicsofPowerSystem

Course Objectives:

1	Tounderstand theimportanceof powersystemstability&control.
2	Tosuggesttheappropriatemethodofreactivepowergenerationandcontrol.
3	To analyze the generation-load balance in real time operation and its effect on frequency and developautomatic control strategies with mathematical relations.
4	To analyze the generation-load balance in real time operation and its effect on frequency and developautomatic control strategies with mathematical relations.

Course Outcomes: Aftersuccessful completionofcoursestudent willbeable to

1.	Recallthebasicconceptofreliability,securityandtransientstabilityincaseofpowersystem.
2.	Practiceformulationofunitcommitmentandeconomicloaddispatchtasksandsolveitusing optimization techniques.
3.	Illustratetheautomaticfrequencyandvoltagecontrolstrategiesforsingleandtwoareacaseand analyze the effects, knowing the necessity of generation control.
4	Identifytheneed forgeneration and controlofreactivepower.
5	DescribevariousadvancedcontrollerssuchasFACTscontrollerswithitsevolution,principleofoperation, circuit diagram and applications.
6	Illustrate various ways of interchange of power between interconnected utilities and define reliabilityaspects at all stages of power system.

UNIT -I	**PowerSystemTransientStability**	**(08Hours)**
	Revision of concept of dynamics of synchronous machine and swing curve, Transient stability analysis-Equal Area Criterion for sudden change in mechanical input, effect of clearing time on stability, sudden loss of one of parallel lines and sudden short circuit on one of parallel lines, point by point method, Methods to improve stability, Introduction to multimachine stability.	
UNIT -II	**OptimalSystemOperation**	**(08Hours)**
	Concept of economic load dispatch, System constraints, Economic dispatch neglecting losses, Optimal load dispatch including transmission losses, Exact transmission loss formula, Modified coordination equations, Automatic load dispatching, Concept of unit commitment, Constraints on unit commitment, Method of unit commitment-priority list method, dynamic programming. (Numericals)	
UNIT -III	**AutomaticGeneration Control(AGC)**	**(08Hours)**
	Concept of AGC, Block diagram of load-frequency control of isolated power system, Steady state & dynamic response, Overview of generation control system,Controlareaconcept-singleareaload-frequencycontrol,twoareaload-frequencyload,optimaltwoareaload-frequencycontrol,tie-linecontrol,Load-	

	frequencycontrolwithgenerationrateconstraints,Effectofspeedgovernordead band on AGC, Digital load-frequency controllers, Decentralized control.	
UNIT -IV	**ReactivePower Control**	**(08Hours)**
	Systemvoltageandreactivepower,Reactivepowergenerationbysynchronous machines, Effect of excitation control, Loading capability curveof a generator, Compensationinpowersystem(Seriesandshuntcompensationusingcapacitors and reactors), Steady state performance of static VAR compensators, sub synchronous resonance.	
UNIT-V	**IntroductiontoFACTsTechnology**	**(08Hours)**
	Introduction to FACT Controller, Principle of operation, characteristics and applicationsofSVC,TCSC,STATCOM,SSSCandUPFC,ComparisonofFACT controllers.	
UNIT -VI	**PowerInterchange**	**(08Hours)**
	Interchangeofpowerbetweeninterconnectedutilities,Emergencyinterchange, Economyinterchangeevaluation,Interchangeevaluationwithunitcommitment, Type of interchange, Capacity interchange, Diversity interchange, Energy banking, Inadvertent power exchange, Power pools.	

TermWork:
Thetermwork shallconsist ofrecordof minimumeight experiments.

1. Solution of swing equation.
2. Equalarea criteria.
3. Stabilityanalysisusingpointbypoint method.
4. Optimaldispatchof power.
5. Singlearealoadfrequencycontrol.
6. Twoarealoadfrequencycontrol.
7. Reactivepowercompensationbyseriesorshuntcompensation.
8. StudyandsimulationofFACTSControllers.I.SVCII.TCSC
9. StudyandsimulationofFACTSControllers. I.STATCOMII.SSSC
10. Studyand Analysisof StateLoad Dispatch Centre.

Projectbasedlearning:

1. StudentshalldemonstrateminimumoneconceptrelatedtoPowersystemstabilitybyusinghardware model or professional software (ETAP/MATLAB/ANSYS Maxwell etc.)
2. Studentshalldemonstrateminimumoneconceptrelatedtooptimalsystemoperationbyusing hardware model or professional software (ETAP/MATLAB/ANSYS Maxwell etc.)
3. Studentshalldemonstrateminimumoneconceptrelatedtoautomaticgenerationcontrolsystemby using hardware model or professional software (ETAP/MATLAB/ANSYS Maxwell etc.)
4. Studentshalldemonstrateminimumoneconceptrelatedtoreactivepowercontrolsystembyusing hardware model or professional software (ETAP/MATLAB/ANSYS Maxwell etc.)
5. StudentshalldemonstrateminimumoneconceptrelatedtoFACTstechnologysystembyusing hardware model or professional software (ETAP/MATLAB/ANSYS Maxwell etc.)
6. Studentshalldemonstrateminimumoneconceptrelatedtoenergycontrolsystembyusinghardware model or professional software (ETAP/MATLAB/ANSYS Maxwell etc.)
7. Arrange Industrial Visit to Load Dispatch Center: Prepare Study Report on Load Dispatch Center functions
8. Casestudy relatedto powersystem stabilityand control.

TextBooks:	
1.ElectricalEnergySystemTheory –Olle IElgerd,TataMcGrawHillPublication.	
2.ModernPowerSystemAnalysis-IJNagrath,DPKothari,TataMcGrawHill Publication	
3.PowerSystemOperation&Control–PSRMurthy,BSPublications.	
4.ReactivePowerManagement–DMTagare,TataMcGrawHillPublication.	
5.ElectricalPowerSystems-C.L.Wadhwa,NewAgeInternational Publishers.	
6.FACTScontrollersinPowerTransmissionandDistribution-K.R.Padiyar,NewAgeInternational Publishers.	
7.Electricalpowersystems-AshfaqHusain,CBS Publishers&DistributorsPvt Ltd.	
ReferenceBooks:	
1.EconomicOperationofPowerSystems-LeonK.Kirchmayer,JonnWiley&Sons.	
2.Powersystemanalysis-JohnJ.Grainer, WilliamD.Stevenson,Jr.TataMcGraw-HillEdition	
3.Understanding FACTS-NarainG.Hingorani, LaszioGyugyi, AJohn Wiley&Sons	
4.Thyristor-BasedFACTSControllerforElectricalTransmissionSystems,R.M.MathurandR.K.Varma, IEEE Press and Wiley Inter-science, New York,2002.	
SyllabusforUnit Test:	
UnitTest -1	UNIT– I,UNIT– II,UNIT - III
UnitTest -2	UNIT– IV, UNIT–V, UNIT-VI

INDUSTRYTAUGHT COURSE-V:INDUSTRIAL DRIVES&APPLICATIONS

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITS ALLOTTED:
Theory:04Hours/ Week	EndSemester Examination:60 Marks	Theory:04
Practical:02Hours/Week	ContinuousAssessment:40 Marks	Practical: 01
	TermWork:25Marks&Practical:25Marks	Total:05

CoursePre-requisites: TheStudentsshouldhave

1.	Construction,WorkingPrinciple&Applicationof ACandDC motors
2.	IntroductionstoElectronicComponentsSCR,Diodes,GTO, IGBT,DIAC &TRIAC etc

Course Outcomes:

1.	Explorethebasicknowledgeofthecomponentsanddynamicsrelatedtoelectricaldrivesandalso able to draw certain characteristics related to electric drives.
2.	Explorevariouselectricalbrakingmethodsandthecharacteristicsrelatedto DCandInduction motors
3.	Performtheoperationofsolidstatecontrolof DCmotorsrelatedtoconvertersandchopper operations
4.	Analyzethe comparisonofvoltagesourceandcurrentsourceinverters
5.	Explorevariousenergysavingtechniquesandselectionofpowerratingsforvariouselectrical motors drives
6.	Exploretherequirementsandapplicationsof electricaldrivesas pertheindustrial pointof view

UNIT -I	**ConceptofElectricalDrives.**	**(08Hours)**
	ElectricDrives:Definition,Advantages,components.Selectioncriteria.Latest trendsinDC&ACDrives,Dynamicsofdrive.Equivalentvaluesofdrive parameters. Load Torque: Components, Natures and classification. Steady state stability: Speed torque characteristics, criteria. Load equalization	
UNIT -II	**ElectricalBraking**	**(08Hours)**
	Electrical braking methods, characteristics of DC Motors: Rheostatic, Plugging, and Regenerative. Electrical braking methodofthree phaseinduction motor:DCDynamicBraking, Plugging, Regenerative Braking, AC Rheostatic braking	
UNIT -III	**SolidStateControlled D.C.Motors**	**(08Hours)**
	Fullycontrolledconverter:Singlephase,threephaseandeffectonperformanceof Shunt excited DC Motor. Open loop and closed loop system. Chopper control converter: Close loop control of DC series & shunt motor in adrive	
UNIT -IV	**SolidStateControlledInductionMotors**	**(08Hours)**
	SteadyStateAnalysis,Thyristorisedstatorvoltagecontrol,Transistorisedstator frequency control: V/f control, voltage source inverter (VSI) control, current source inverter (CSI) control, Steady State Analysis, Relative merits and demerits of VSI and CSI for induction motor drive. Introduction to Multilevel Inverter	
UNIT -V	**EnergySavingTechniquesandPowerRatingofDriveMotor**	**(08Hours)**
	EnergySavinginstartingofInductionMotorDrive:Types,rotorresistance, reduced voltage. EnergySavinginrunningofinductionmotordrivingpumpandblower: Consideration of load torque characteristics and energy saving calculations.	

	Power Rating: Load diagram, Heating and cooling, Thermal Resistance, Selectionofmotorpowercapacity,Deratingofmotor,effectofharmonic current, short time rating.	
UNIT -VI	**IndustrialApplicationsandLatesttrendsin Drives**	**(08Hours)**
	Industrial Applications: Drives for Rolling mills (Four Quadrant Operation), Machine tools (Constant Torque Application), Textile mills (Synchronized operationofDriveinTandom),SugarMills:CentrifugedDrive.Latesttrendsin Drives: Commutatorless DC Motor, Servo Drives, Stepper motors.	

TERMWORK:(Studentsshouldperformatleast08experimentsfromthe followinglist)

Minimum 8 experiments

1. Electricalbraking ofD.C. Shunt motor.
2. Electricalbrakingof3-phaseInductionMotor.
3. SinglephaseconverterfedseparatelyexcitedD.C.motor.
4. Threephaseconverter fed/Dualconverterfed/converterfedseparately excitedD.C.motor.
5. ChopperfedD.C.seriesmotor.
6. VSIfed3-phase Induction motor.
7. Solidstatestator voltagecontrolof 3-phase Induction motor.
8. Closedloop speedcontrol ofD.C. motor.
9. ClosedloopspeedcontrolofInduction Motor
10. ApplicationofJonesChopperforspeedcontrol/Quadrantoperation.
11. Energysavingin softstarting ofinduction motor.

PROJECTBASED LEARNING:

1. Marketsurveysofvarioustypesofdrivemotorsavailableandpreparingreportonthesame with detailed specifications.
2. Atleast02Industrial visitstoanyDrives manufacturingplantandpreparereportonthesame.
3. Preparareportон casestudyon RecentTrends in Drivesforvarious industries.
4. Writereviewpaperrelatedtocourseandpublishinpeerreviewed journal.
5. Participateinconference orprojectcompetitionandproducecertificateforthesame.

TextBooks:

1. BimalKBose,ModernpowerelectronicsandACdrives,Pearsoneducationasia
2. G.K.Dubey,FundamentalsofElectricalDrivesCRCpress2002
3. VedamSubrahmanyamElectricDrives:Concepts&ApplTataMcGraw-Hill
4. Powerelectronicsconvertors,applicationsanddesign,NedMohan,ToreMUndeland,WilliamPRobbins, Wiley India Pvt. Ltd., 2009
5 E.Acha,Miller&Others,PowerElectronicControlinElectricalSystems(Newnes,Oxfordpublication) – first Edition
6 M.H.RashidPowerElectronics,PrenticeHallof IndiaPvt.Ltd.NewDelhi,(3rdEdition)
7. RKrishnan, Electricmotordrives, modeling, analysisand control, PHIlearning Pvt. ltd. 2001
8. S.K.Pillai,Afirstcourseinelectricaldrives,Newageinternationalpublishers.2010

ReferenceBooksandPapers:

1V.Subrahmanyam,“ElectricDrives:Concepts& Application”,TataMc-Graw Hill
2. K.Bose,“ModernPowerElectronicsandACDrives”,PearsonEducation
3. R.Krishanan,“ElectricMotorDrives – ModelingAnalysisand Control”,PHI India

SyllabusforUnit Test:	
UnitTest -1	UNIT– I,UNIT– II,UNIT - III
UnitTest -2	UNIT– IV, UNIT–V, UNIT-VI

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology
Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

PowerQualityIssues&MitigationTechniques		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04	EndSemesterExamination:60Marks	Theory:04
Practical:02	InternalAssessment:40Marks	Practical: 01
	TW:25Marks OR:25Marks	Total:05

CoursePre-requisites:

TheStudentsshouldhavepriorknowledgeof

PowerSystem,ElectricalInstrumentationandMeasurement,IndianandInternationalPowerandsafety codes

CourseObjectives:

Theobjectiveofthiscourseistointroducethestudentstotheimportanceof PowerQuality,itsterms, measurement technique, power quality mitigation techniques and relevant standards.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto

1	UnderstandthebasicsofPower Quality.
2	DiscusstheconceptandimportanceofVoltageSag
3	Understandtheconceptandconsequencesof Overvoltage
4	Design,Evaluate,compareHarmonicfiltersandunderstandtheconceptofharmonics.
5	DiscussandunderstandthetechniquesandimportanceofPowerQualitymonitoring
6	CompareandunderstandthevariousPowerqualitymeasurementsystemsanditsguidelines.

UNIT–I	**BasicsofPowerQuality**	**(08 Hours)**
	WhatisPowerQuality?PoorandGoodPowerQuality,Symptomsofpoorpowerquality, ImportanceofPowerQuality,PowerQualityevaluationprocedure,PowerQualityterms- under voltage - over voltage. Concepts of transients – short duration variations such as interruption - long duration variation such as sustained interruption. Sags and swells - voltagesag-voltageswell-voltageimbalance-voltagefluctuation,waveformdistortion. International bodies governing Power Quality, CBEMA curve, ITIC curve.	
UNIT-II	**VoltageSag**	**(08 Hours)**
	Concept of Voltage Sag, Sources of Voltage Sag, Impacts of Voltage Sag, Voltage Sag mitigationtechniques,VoltageSagduetoInductionMotorstarting.Estimatingvoltage sagperformance-Thevenin'sequivalentsource.	
UNIT-III	**Over Voltage**	**(08 Hours)**
	Sources of over voltages - Capacitor switching – lightning – ferro resonance. Mitigation of voltage swells - surge arresters - power conditioners. Lightning protection –shielding –linearresters-protectionoftransformersandcables.Anintroductiontocomputer analysistoolsfortransients,PSCAD,EMTP,ETAP,MATLABetc	
UNIT-IV	**Harmonics**	**(08 Hours)**
	Harmonic sources from commercial and industrial loads - Locating harmonic sources – Powersystemresponsecharacteristics-HarmonicsVstransients.Effectofharmonics– Harmonicdistortion-Voltageandcurrentdistortions-Harmonicindices-Inter harmonics. Design of Harmonic filter.	
UNIT-V	**PowerQualityMonitoring**	**(08 Hours)**
	SelectioncriterionforPowerQualitymeasuringdevices-Monitoringconsiderations- monitoringanddiagnostictechniquesforvariouspowerqualityproblems–powerquality	

	analyzer-powerlinedisturbanceanalyzer–quality measurementequipment–harmonic /spectrumanalyzer-flickermeters–DisturbanceAnalyzer.Applicationsofexpert systems for power quality monitoring.	
UNIT-VI	**PowerQualityMeasurement**	**(08 Hours)**
	Power quality measurement devices, power quality measurements, Number of test locations, Test duration, Instrument set-up, Instrument set up guidelines. Distributed GenerationandPowerQuality:ResurgenceofDG,Distributedgenerationtechnologies, Interfacetotheutilitysystem,Powerqualityissues,Operatingconflicts.	

Term Work:

Thetermworkshallconsistofrecordofminimumeightexperimentsandnotlimitedto

1.Study ofVoltageSagfor3-PhaseInductionMotorstarting
2.DesignofSVCinMATLABforReactivePowercompensation
3.DesignandimplementationofHarmonic FilterinETAPforHarmonic mitigation.
4.DesignandimplementationofHarmonicFilterinMATLABforHarmonicmitigation.
5.DesignofacapacitorbankinETAPanditsimplementation.
6.StudyofharmonicdistortionlimitsinagreementwithIEEE519-1992
7.Studyofpowerqualitymonitoringstandardssuchas IEEE1159andIEC61000-4-30
8.CasestudyofDGandPowerQualitySite
9.Measurementofcurrentharmonicsusingcurrentprobe.
10.StudyandcalculationofTHDandIHDofvarioustypesofnon-linear loads

ProjectBased Learning

1.DesignofSeriesReactortolimitShortCircuitcurrents
2.DesignofFACTSdevices
3.DesignandimplementationofHarmonicfilter
4.ShortcircuitanalysisofaWind/ Solarfarm
5.ReactivePoweranalysisandcompensationofapowerplant
6.TransientAnalysisandfaultclearing
7.ShortCircuitanalysisforprotectivedevices
8.Harmonicfilterdesign

Text Books:

1.ElectricalPowerSystemsQuality,DuganRC,McGranaghanMF,SantosoS,andBeatyHW,Second Edition, McGraw–Hill, 2012, 3rd edition.
2.Electricpowerqualityproblems–M.H.J.BollenIEEEseries-WileyIndiapublications,2011.
3.PowerQuality-ShripadDesai-TechNeoPublications, 2020
4.BhimSingh,AmbrishChandra,KamalAl-Haddad,"PowerQualityProblems&MitigationTechniques" Wiley, 2015.

ReferenceBooks:

1.PowerQualityPrimer,KennedyBW,FirstEdition,McGraw–Hill,2000.
2.UnderstandingPowerQualityProblems:VoltageSagsandInterruptions,BollenMHJ,FirstEdition,IEEE Press; 2000.
3.Power SystemHarmonics,ArrillagaJandWatsonNR,SecondEdition,JohnWiley&Sons, 2003.
4.G.T.Heydt,"ElectricPowerQuality",2ndEdition.(WestLafayette,IN,StarsinaCirclePublications,1994.

SyllabusforUnitTest:

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

ElectiveI Digital Signal Processing		
TEACHING SCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:03	EndSemester Examination:60 Marks	Theory:03
Practical:	InternalAssessment:40 Marks	Total:03

CoursePre-requisites:	
TheStudents should haveprior knowledgeof	
	Digitalelectronics, electronics
Course Objectives:	
	This course is designed to offer learners an introduction to digital signal processing, its applications in the industry. Learners will gain deep insights intohow digital electronics is being used in industry to overcome challenges in industry
Course Outcomes: Afterlearningthis coursestudentswill beableto	
1	Understandtheconcept ofdigitalsignalprocessing
2	Demonstrateand applytheknowledgeofdigitalsignalprocessing
3	Evaluatetheapplicationofdigitalsignalprocessinginindustry
4	Applytheconcepts ofdigitalsignal processing
5	Evaluatetheperformanceofequipmentequippedwithdigitalsignalprocessing
6	Discusstheuseofdigitalsignal processingin industryandeconomy relatedto that

UNIT – I	CLASSIFICATIONOFSIGNALS	**(06 Hours)**
	Analog, Discrete-time and Digital, Basic sequences and sequence operations, Discrete-time systems, Linear Time Invariant Systems, impulse response, linear convolution and its properties, Linear constant coefficient difference equations, Sampling,	
UNIT -II	FOURIERTRANSFORM	**(06 Hours)**
	RepresentationofSequencesbyFourierTransform,SymmetrypropertiesofF.T., F.T.theorems:Linearity,timeshifting,frequencyshifting,timereversal, differentiation, convolution theorem, windowing theorem, Z transform,	
UNIT -	FREQUENCYRESPONSEOFLTISYSTEMS	**(06 Hours)**
	Ideal frequency selective filters, magnitude and phase response, group delay, System Functions for LTI Systems: Stability and causality, inverse systems, significance of poles/zeros, Frequency Response for Rational System Functions:	
UNIT-IV	SAMPLINGTHEF.T.	**(06 Hours)**
	The Discrete Fourier Transform, Properties of DFT: Linearity, circular shift, duality, symmetry, Circular Convolution, Linear Convolution using DFT, Effective computation of DFT and FFT, DIT FFT, DIF FFT, Inverse DFT using FFT	
UNIT -V	FILTERS	**(06 Hours)**
	Concept of filtering, Ideal filters and approximations, specifications, IIR filter design from continuous time filters: Characteristics of Butterworth, Cheybyshev andellipticapproximations,impulseinvariantandbilineartransformation	

	techniques,	
UNIT-VI	BasicsofIIR	**(06 Hours)**
	BlockdiagramsandSignalflowgraphrepresentationofLCCDE,Basicstructures for IIR Systems: direct form, cascade form, parallel form, Transposed Forms. Applications of digital signal processing in audio signal processing, video data compression, computer graphics, digital image processing, speech processing, speech recognition.	

ProjectBasedLearningonthebroadareasofandnotlimited to

1.Classification ofsignals
2.Measurementofpower, DSPbased vibrationanalysis system
3.ApplicationsofFourierTransform
4.Measurement of frequency
5.Frequency responseofLTIsystems
6.Condition monitoringofElectricalMachines
7.ComputationofDFT
8.Applications of IIRandFIRfilters
9.Applications ofDSP inpower systems
10.SpectrumAnalysis,Powerfactorcorrection

TextBooks:

1.MitraS.,"DigitalSignalProcessing:AComputerBasedApproach",TataMcGraw-Hill,1998,SBN 0-07-044705-5
2.ProakisJ.,ManolakisD.,"Digitalsignalprocessing",3rdEdition,PrenticeHall,ISBN81-203-0720- 8
3.TheScientistandEngineer'sandGuidetoDigitalSignalProcessingbyStevenW.Smith.Onlinetext.
4.4.DigitalSignalProcessingandtheMicrocontrollerbyDaleGroverandJohnR.(Jack)Dellerwith illustrations by Jonathan Roth.

ReferenceBooks:

1.OppenheimA.,SchaferR.,BuckJ.,"Discretetimesignalprocessing",2ndEdition,PrenticeHall, 2003, ISBN-81-7808-244-6
2.Rebizant,Waldemar,Szafran,Janusz,Wiszniewski,Andrzej,"DigitalSignalProcessinginPower SystemProtectionandControl",1stEdition.Springer,2011,ISBN0857298011,9780857298010
3.Theoryand ApplicationofDigital SignalProcessing byRabinerand Gold.Prentice-Hall, 1975-24
4.DigitalSignalProcessingbyWilliamD.Stanley.RestonPublishingCompany,1975 -Digital electronics

SyllabusforUnit Test:

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

Testing&CommissioningofElectricalEquipments		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:03	EndSemester Examination:60 Marks	Theory:03
Practical: 00	InternalAssessment:40Marks	Total: 03
CoursePre-requisites:		
TheStudents should haveprior knowledgeof		
FundamentalsofElectricalMachines,ElectricalMeasurements		

Course Outcomes: Afterlearningthis coursestudentswill beableto	
1	Understandthesafetymanagement.
2	Learninstallationofelectricalequipment.
3	Learntestingof transformer.
4	Applytheconceptsforinstallationandcommissioningofrotatingelectricalequipment.
5	Evaluatetheknowledgefor commissioningoftransmission lines.
6	Evaluatetheknowledgefor Switchgear andprotectivedevices.

UNIT – I	**SafetyManagement**	**06 Hours**
	Objectives, Safety Management during Operation and Maintenance, Clearance and Creepages, Electric Shock, need of Earthing, different methods of Earthing, factors affecting the Earth Resistance, methods of measuring the Earth Resistance, Equipment Earthing and System Grounding, Earthing Procedure - Building installation, Domestic appliances, Industrial premises, Earthing of substation, generating station and overhead line. Fire safety and industrial safety practices.	
UNIT -II	**InstallationofElectricalEquipment**	**06 Hours**
	Inspection of Electrical Equipment at site, Storage Electrical Equipment at site, Foundation of Electrical Equipment at site, Alignment of Electrical Machines, Tools/Instrumentsnecessaryforinstallation,Technicalreport,Inspection,storage and handling of transformer, switchgear and motors. Installation of electrical vehicle charging station. Installation of solar power system.	
UNIT -	**Testingof Transformer**	**06 Hours**
	General Requirements for Type, Routine and Special Tests, Measurement of winding resistance; Measurement of voltage ratio and check of voltage vector relationship;Measurementofimpedancevoltage/short-circuitimpedanceandload loss; Measurement of no-load loss and current; Measurement of insulation 13 28 resistance; Dielectric tests; Temperature-rise, insulation and HV test, dielectric absorption, switching impulse test. testing of Current Transformer and Voltage Transformer, power transformer, distribution transformer, CVT and special transformer with reference to Indian Standard (IS). Drying out procedure for transformer. PI index, Commissioning steps for transformer, Troubleshooting & Maintenanceoftransformer.[Ref:IS2026:Part_1-10-PowerTransformers: MethodsofTest;IS13956:1994-TestingTransformers]	
UNIT-IV	**InstallationandCommissioningofRotatingElectrical Machines:**	**06 Hours**
	Degree of protection, cooling system, degree of cooling with IP- IC code (brief discussion),enclosures,ratingofindustrialrotatingelectricmachine,installation, commissioningandprotectionofinductionmotorandrotatingelectricmachine,	

	drying out of electric rotating machine, insulation resistance measurement, site testingandchecking,care,servicesandmaintenanceofmotors,commissioningof synchronous generator, protection and automation of synchronous generator, synchronous motor, D.C. generator and motor with reference to Indian Standard (IS). [Ref: IS 4029:2010-Guide for Testing Three Phase Induction Motors; IS 7132:1973-Guide for Testing Synchronous Machines; IS 9320:1979-Guide for Testing of Direct Current (dc) Machines]	
UNIT -V	**Transmissionline**	**06 Hours**
	CommissioningofA.CtransmissionlineandHVDCtransmission,galvanizesteel structure,towersandinsulatorfortransmissionanddistributionline,towerfooting resistance,substationequipment,busbar system, power cable, lowpowercontrol cable,Contactor,GIS(gasinsulatedsubstation).	
UNIT-VI	**Switchgear,protectivedevicesandsoftwarefor testing**	**06 Hours**
	Standards, Classification, specification, rating and duties of CB, installation, commissioningtests,maintenanceschedule,type&routinetests.Operationofs/s (steps) for line Circuit breaker maintenance. Location of lightening arrester with reasons.Differentsoftware'susedfortestingalongwithdifferentsoftwaretesting tools.	

ProjectBasedLearningonthebroadareasofandnotlimited to

1.A casestudyforsafety rulesinelectricalengineering laboratory.
2.A casestudyfortesting standardsfor transformer.
3.Acasestudyfortestingstandardsfor rotatingelectricalmachines(DC).
4.Acasestudyfortesting standardsfortransmission lines.
5.A casestudyfortestingstandardsfor switchgear.
6.Acasestudyfortesting standardsforprotectivedevices.
7.Acasestudyfortestingstandardsfor rotatingelectricalmachines(AC).
8.Acasestudyforinstallation ofelectrical equipment.

TextBooks:

1.Rao,S.,"Testing,commissioning,operationandmaintenanceofelectricalequipment",6/E.,Khanna Publishers, New Delhi
2.Paul Gill,"Electricalpowerequipmentmaintenanceandtesting",CRCPress,2008.
3.SinghTarlok,"Installation,commissioningandmaintenanceofElectricalequipment",S.K.Kataria and Sons, New Delhi,

ReferenceBooks:

1.Philip Kiameh,"ElectricalEquipmentHandbook:TroubleshootingandMaintenance",McGrawHill
2.RelevantIndianStandards(ISCode)andIEEEStandardsfor-Installation,maintenanceand commissioning of electrical equipments/machines.
3.B.V.S.Rao, "Installation,Maintenanceandtestingvol. I&II,"S. Chand&Co.
4.RCH Richardson,"Thecommissioningof ElectricalPlant",Chapman&Hall.

SyllabusforUnit Test:

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

Elective-I-UtilizationofElectricalEnergy		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:03	EndSemesterExamination:60Marks	Theory:-03
	ContinuousAssessment:40Marks	Total: -03

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

BasicsofElectricalEngineering,DC&ACMachines

CourseObjectives:

- Topossessknowledgeofadvancedandemergingtopicsintractionmechanismandilluminationengineering and their applications in the field.
- Anabilitytodesignatractionsystem,acomponent,tomeetdesiredneedsoflocomotiveindustrywithin realistic constraints and confirms manufacturability, and sustainability.
- Tomoldstudentsprofessionallytopossessin-depthandadvancedknowledgebycoursecontentsalongwith emerging topics.

CourseOutcomes: Studentswillbeableto

1.	IdentifytypesofTractionSystem
2.	InterpretVariousPowersupplyinElectricTraction
3.	AnalyzeVariousTractionMotors.
4.	DefinemethodsofTractionmotorControl.
5.	ElaborateTrainmovement&BreakinginTractionsystem.
6.	ClassifytheindoorandoutdoorIlluminationsystem.

UNIT-I	**ElectricTractionSystem:**	**(06 Hours)**
	Electrical transmission: Electrical transmission system employing D.C. generator D.C. series motor, Electrical transmission system employing 3 phase alternator supplying D.C. traction motors, electrical transmission employing 3 phase alternator supplying induction motors, Choice of traction system-battery drive, hybrid drive, flywheel drive, tramways, trolleybus.Trackelectrification:D.C.System,singlephaselowfrequencyA.C.system, singlephasehighfrequencyA.C.system,3phaseA.C.systemandcompositesystem.	
UNIT-II	**PowerSupplyforElectricTraction:**	**(06 Hours)**
	Current collection system, current collectors for Over Head Systems, Overhead constructionforTramwaysandtrolleybusesandrailways,SagandTensioncalculationfor atrolleywire,Tractionsubstations,locationofsubstations,feedinganddistributingsystem, substationequipment's. Block Diagram of ACElectric locomotive, Signaling interference intelecommunicationcircuits.	
UNIT-III	**TractionMotors:**	**(06Hours)**
	Characteristicsoftractionmotors,straightD.C.seriesmotor,suitabilityofseries motorfor tractionduty,constructionaldetailsofD.C.TractionMotors,Seriesmotorusingundulating D.C,suitabilityofshuntmotorfortractionduty,singlephaseseriesmotors,Repulsion motor, compensated repulsion motor, Induction motor with variable frequency with SCR, Linear Induction motor.	
UNIT-IV	**TractionControl:**	**(06 Hours)**
	Traction control: Duty cycle, Methods of traction motor control, series-Parallel and other types of controllers, use of interlocks, run back prevented, multiple unit control, Master controllers, Reverses, Dead man's handle, use of Metaldyne and Megavolt.	
UNIT-V	**TrainMovementand Braking:**	**(06 Hours)**

	Train Movement: Speed time curve, its analysis and construction, schedule speed and factorsaffectingit,trainresistanceanditscomponents.Tractiveeffortcalculations,average acceleration and speed, energy output and consumption. **Braking:** Mechanical versus electric breaking, rheostatic braking, Regenerative braking, method and energy saved in the process, Magnetic track brakes.	
UNIT-VI	**Illumination:**	**(06 Hours)**
	Requirementofgood lighting,Classificationoflight fitting& luminaries, factorstobe consideredfordesignofindoor&outdoorlightingscheme,DesignProcedureforfactory lighting,streetlighting.	

Projectbasedlearning:

- CaseStudyforElectrictractionmotorfailure.
- Articlerelatedtocoursetopicfromany unit.
- StudyofcomponentsusedinTraction substation.
- MotorAccelerationanalysisinETAPsoftware

Text Books:

1.UtilizationofElectricalPowerandElecticTractionbyJ.B.Gupta.(KatsonBookpublisher)
2.RaoP.S.,Principleof25KVOverheadEquipments.R.(Nasik)PrintpackPvtLtd,,1stEd.
3.ElectricTractionforRailwayTrains,byEdwardP.Burch.McGrawHillBookCo.Inc.
4.C.L.Wadhwa,"Generation,DistributionandUtilizationofElectricalEnergy",NewAgeInternationalPublishers.

ReferenceBooks:

1.H.Partab:ModernElectricTraction,DhanpatRai&sons.
2.UpadhayayJ.&MahindraS.N.,ElectricTraction,AlliedPublishersLtd.,1stEd.

SyllabusforUnitTest:

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

ElectiveIRobotics		
TEACHING SCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:03	EndSemester Examination:60 Marks	Theory:03
Practical:	InternalAssessment:40 Marks	Total:03

CoursePre-requisites:

TheStudents should havepriorknowledgeof

Basicmechanicalengineering,sensors,Computersystem,

Course Objectives:

This course is designed to offer learners an introduction to robotics and its applications in the industry and home. Learners will gain deep insights into how robots are used in industry and at homes to enhance the production.

Course Outcomes: Afterlearningthis coursestudentswill beableto

1	Understandthe conceptofrobotics
2	Demonstrateand applytheknowledgeofrobotics
3	Evaluatetheperformanceof robotics
4	Applytheconceptsofrobotics
5	Evaluatetheapplicationsofrobotics
6	Discussuseofrobotics in automation

UNIT – I	INDUSTRIALAPPLICATION	**(06 Hours)**
	Introduction to Automation industry, Requirement of robots, different Industrial Application of robots, top 10 Robot manufacture, Humanoid robot, industrial robots, robots for home automation, municipal robots, drones, delivery robots, chat bots	
UNIT -II	ROBOT STRUCTURE	**(06 Hours)**
	Basic Concepts and definition, Laws of Robotics, Robot anatomy, Robot Joints and links -Architecture of robotic systems, Specification and Application of Robots, Classification of robots, manipulators types serial, parallel	
UNIT -	Robotmotors and Drives	**(06 Hours)**
	TypesofDrives,ActuatorsRobotdrivemechanismselectric,ACmotordrive, brushed D C motor drive, brush less DC motor drive, geared D C motor drive,servomotor drive, stepper motor, hydraulic drive, pneumatic drives	
UNIT-IV	PowerTransmission Systems	**(06 Hours)**
	Geartransmission,Beltdrives,cables,Rollerchains,Link -Rodsystems-Rotary- to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws	
UNIT -V	SENSORSANDROBOT PROGRAMMING	**(06 Hours)**
	Touch,Temperature,Light,Sound,position,flow,proximity,infrared,ultrasonic, sensors, GPS, Robot programming, lead through programming, motion interpolation,useofblockchainrobotics.Useofartificialintelligenceinrobotics, use of internet of things in robotics	
UNIT-VI	MACHINEVISION SYSTEM	**(06 Hours)**

	Machine Vision System: -Vision System Devices, Image acquisition, Masking, Sampling and quantization, Image Processing Techniques, Edge detection, Segmentation. Robotic process automation, Robotics as a service, autonomous robots, multipurpose robots.	

ProjectBasedLearningonthebroadareasofandnotlimited to

1.Studyof sensor integration

2.Design,modeling andanalysisof twodifferent typesof grippers

3.Twoprogramfor linear andnon-linear path

4.Study of roboticsystem design.

5.Virtualmodelingforkinematicanddynamicverificationanyoneroboticstructureusingsuitable software

6.Settingrobot forany oneindustrialapplication afterindustrial visit.

7.Reporton IndustrialVisit

8.List out thetop 10 Robot manufacturer

9.Writeareportonperformance-resolution,accuracy,repeatability, compliance

10.StudyofRotary-to-Linearmotion conversion

TextBooks:

1.DebS.R.andDebS.,"RoboticsTechnologyandFlexibleAutomation",TataMcGrawHillEducation Pvt. Ltd, 2010.

2.JohnJ.Craig,"IntroductiontoRobotics",Pearson,2009.3.MikellP.Grooveret.al.,"Industrial Robots - Technology, Programming and Applications",McGraw Hill, New York, 2008.

3.SBNiku,IntroductiontoRobotics,Analysis,Control,Applications,2ndEdition,WileyPublication, 2015

4.Craig.J.J."IntroductiontoRoboticsmechanicsandcontrol",Addison-Wesley,1999.

ReferenceBooks:

1.RichardDKlafter,ThomasAChmielewski,MichaelNegin,"RoboticsEngineering–AnIntegrated Approach", Eastern Economy Edition,Prentice Hall of India Pvt.Ltd., 2006

2.FuKS,GonzalezRC,LeeC.S.G,"Robotics:Control,Sensing,VisionandIntelligence",McGraw Hill, 1987 54EE650221

3.A Ghosal, Robotics:FundamentalConceptsand Analysis ,OxfordUniversityPress, 2013.

4.RK Mittal& IJ Nagrath,Robotics andControl ,McGrawHillPublication, 2015.

5.RayAsfahl.C.,"Robots andManufacturing Automation",JohnWiley &SonsInc.,1985.

SyllabusforUnit Test:

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

Elective-I-Smart Grid		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:03	EndSemesterExamination:60Marks	Theory:-03
	ContinuousAssessment:40Marks	Total: -03

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

PowerGenerationSystems,BasicknowledgeofSubstation,PowerSystemandFACTSdevices.

CourseObjectives:

- Toenablethestudentsacquireknowledgeonsmartgrid,differentoptionsofarchitecturaldesignand communication technology for various aspects of smart grid.
- System analysis and stability analysis in smart grid, renewable energy sources and storage integration with smart grid.

CourseOutcomes: Studentswillbeableto

1.	Understandtheconceptofsmartgrid–developmentand policies.
2.	Explorethesmartgridtechnologiesinpowersystem.
3.	Understandtheconceptofsmartmetersandexploreits applications.
4	Understandthepowerqualityissuesandexploretheenergyaudittechniquetoreducethe issues.
5	Understandtheconceptofmicro-gridandexploretheintegrationofmicro-grids.
6	Exploretherangeofhighspeed computationaspersmartgrid application.

UNIT-I	**IntroductiontoSmart Grid:**	**(06 Hours)**
	Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers,functions,opportunities,challengesandbenefits,Differencebetweenconventional & Smart Grid, Concept of Resilient & Self Healing Grid, Present development & InternationalpoliciesinSmartGrid,Diverseperspectivesfromexpertsandglobal Smart Gridinitiatives.	
UNIT-II	**SmartGrid Technologies:**	**(06 Hours)**
	Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAr control, Fault Detection, Isolation and service restoration, Outage management, High Efficiency Distribution Transformers, PhaseShiftingTransformers,Plug inHybridElectricVehicles (PHEV).	
UNIT-III	**SmartMeters:**	**(08Hours)**
	Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor MeasurementUnit(PMU),IntelligentElectronicDevices(IED)&theirapplicationfor monitoring&protection.	
UNIT-IV	**PowerQualityManagementinSmartGrid:**	**(06 Hours)**
	PowerQuality& EMCinSmart Grid,Power Qualityissuesof GridconnectedRenewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Qualitymonitoring, Power Quality Audit.	
UNIT-V	**Micro-gridsandDistributedEnergyResources:**	**(06 Hours)**
	Concept of micro-grid, need & application of micro-grid, formation of micro-grid, Issues ofinterconnection,protection&controlofmicro-grid,Plastic&Organicsolarcells,thin	

	film solar cells, Variable speed wind generators, fuel cells, micro-turbines, Captive power plants, Integration of renewable energy sources.	
UNIT-VI	**HighPerformanceComputing:**	**(06 Hours)**
	LocalAreaNetwork(LAN),HouseAreaNetwork(HAN),WideAreaNetwork (WAN),BroadbandoverPowerline(BPL),IPbasedProtocols,BasicsofWebService and CLOUDComputingtomakeSmartGridssmarter,CyberSecurityforSmartGrid.	

Projectbasedlearning:

- CaseStudyforpowerqualityauditforanyparticularsystem.
- Articlerelatedtocourse topic.
- Developamicro-gridapplicationinlaboratory
- Smartgridanalysisconsideringsuitableapplication.

Text Books:

1. AliKeyhani,MohammadN.Marwali,Min Dai,IntegrationofGreenandRenewableEnergyinElectricPower Systems, Wiley.
2. ClarkW.Gellings,TheSmartGrid:EnablingEnergyEfficiencyandDemandResponse,CRCPress.
3. JanakaEkanayake,NickJenkins,KithsiriLiyanage,JianzhongWu,AkihikoYokoyama,SmartGrid:Technology and Applications, Wiley.
4. JeanClaudeSabonnadiere,NouredineHadjsaid,SmartGrids,WileyBlackwell19.
5. StuartBorlase,SmartGrids(PowerEngineering),CRCPress.

ReferenceBooks:

1. AndresCarvallo,JohnCooper,TheAdvancedSmartGrid:EdgePowerDrivingSustainability,ArtechHouse Publishers
2. R.C.Dugan,MarkF.McGranghan,SuryaSantoso,H.WayneBeaty,ElectricalPowerSystemQuality,2nd Edition, McGraw Hill Publication.
3. JamesNorthcote,Green,RobertG.WilsonControlandAutomationofElectricPowerDistributionSystems (Power Engineering), CRC Press.
4. MladenKezunovic,MarkG.Adamiak,AlexanderP.Apostolov,JeffreyGeorgeGilbertSubstationAutomation (Power Electronice and Power Systems), Springer
5. MladenKezunovic,MarkG.Adamiak,AlexanderP.Apostolov,JeffreyGeorgeGilbertSubstationAutomation (Power Electronice and Power Systems), Springer
6. JamesMomoh,SmartGrid:FundamentalsofDesignandAnalysis, Wiley.

SyllabusforUnitTest:

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

ElectiveI:HVDC

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITS ALLOTTED:
Theory:03Hours/ Week	EndSemester Examination:60 Marks	Theory:03Credits
Practical:00Hours/Week	ContinuousAssessment:40 Marks	
		Total:03 Credit

CoursePre-requisites: TheStudentsshouldhave

1.	Powersystem,powersystemprotection,powersystemoperationandcontrol,powerelectronics

Course Outcomes:

1.	**Develop**theknowledgeofHVDCtransmissionandHVDCconvertersandtheapplicabilityand advantage of HVDC transmission over conventional AC transmission.
2.	**Formulate** and **solve** mathematical problems related to rectifier and inverter control methods and learn about different control schemes as well as starting and stopping of DC links
3.	**Analyze** the different harmonics generated by the converters and their variation with the change in firing angles.
4.	**Develop** harmonic models and use the knowledge of circuit theory to develop filters and assess the requirement and type of protection for the filters.
5.	**Study**and**understand**thenatureoffaultshappeningonboththeACandDCsidesoftheconverters and formulate protection schemes for the same.
6.	**Review**theexistingHVDCsystemsalongwithMTDCsystemsandtheircontrolsandrecognizethe need to follow the advancements in both the existing systems and HVDC systems and **determine** the most economic coexistence of both.

UNIT -I	**IntroductiontoHVDC transmission**	**(06Hours)**
	Introduction of DC power transmission technology, comparison of AC and DC transmission, limitation of HVDC transmission, reliability of HVDC systems, application ofDC transmission, description ofDCtransmission system, planning for HVDC transmission, moderntrends in DC transmission.	
UNIT -II	**ConverterandHVDCsystem control**	**(06Hours)**
	General, Principles of DC link control, Converter control characteristics, System control hierarchy, firing angle control, Current and extinction angle control, Starting and stopping of DC link, Power control, Higher level controllers. PrinciplesofDCLinkControlinaLCCHVDCSystem.ControlHierarchy,Firing Angle Control, Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a DC Link. Higher level Controllers, Power control, Frequency Control, Reactive Power Control, Principles of DC Link Control in a VSCbasedHVDCsystem:Powerflowanddcvoltagecontrol.ReactivePower Control/ AC voltageregulation using VSC.	
UNIT -III	**Analysisof HVDCConverters**	
	ChoiceofconverterconfiguraƟon,simplifiedanalysisofGraetzcircuit,converter bridgecharacteristics, Characteristics ofatwelve pulse converter,detailed analysis of converters. BasicPrincipalofthree-phaseAC–DCConversion,sixpulseconverteroperation, Effect of Delaying the Firing Instant, The Commutation Process, Analysis of the CommutationCircuit,Analysisneglectingcommutationoverlap,Rectifier	

	Operation, Inverter Operation, Power Factor and Reactive Power, Characteristic Harmonics, DC Side Harmonics, AC Side Harmonics, Twelve Pulse Converters operation, AC/DC side voltage and current waveforms, Expressions for average dc voltage.	
UNIT -IV	**Harmonics &Filters**	**(06Hours)**
	Generation of harmonics by converters, characteristics of harmonics on DC side, characteristicsofcurrent harmonics,characteristicvariationofharmoniccurrents with variation of firing angle and overlap angle, effect of control mode on harmonics, non characteristic harmonic. Harmonic model and equivalent circuit, use of filter, filter configuration, design of band pass and high pass filter, protectionoffilters,DCfilters,powerlinecommunicationandRInoise,filters withvoltagesourceconverterHDVC schemes.	
UNIT -V	**FaultandprotectionschemesinHVDCsystems:**	**(06Hours)**
	Nature and types of faults, faults on AC side of the converter stations, converter faults, fault on DC side of the systems, protection against over currents and over voltages, protection of filter units.	
UNIT -VI	**MultiTerminalHVDCSystem**	**(06Hours)**
	Multi Terminal HVDC System Introduction, Types of Multi-terminal HVDC System,ParallelOperationofHVDC,ControlofPowerinMTDC,Disconnecting of units or converters, Modern Trends in HVDC Technology. Introduction to Modular Multi-level Converters. Multilevel DC systems. Power upgrading and conversion of AC lines into DC lines, Parallel AC/DC systems, FACTS and FACTS converters.	

PROJECTBASED LEARNING:

6. Marketsurveysofvarioustypesofdrivemotorsavailableandpreparingreportonthesamewith detailed specifications.
7. IndustrialvisitstoanyHVDSystems.
8. StudyofvariousHVDCtransmission systemcomponentsandits applications
9. Writereviewpaperrelated tocourseandpublish inpeerreviewed journal.
10. Participateinconference orprojectcompetitionandproducecertificateforthesame.
11. Studyof DClink control inVSC basedHVDC transmission systems.
12. Studyofreactivepower controlinHVDCtransmissionsystems.

TextBooks:

1. HVDCTransmission,S.Kamakshaiah&V. Kamaraju,TataMcGrawhilleducation
2. HVDC Powertransmission system,K.R.Padiyar,WileyEastern Limited
3. High VoltageDirectCurrentTransmission,J.Arrillaga,Peter Pregrinu

ReferenceBooksandPapers:

1. PowerSystemStabilityand ControlbyPrabhaKundur,McGraw hill
2. PadiyarKR"FACTSControllersinPowerTransmission&Distribution",NewAge.
3. PowerSystemAnalysis:OperationandControl,AbhijitChakrabartiandSunitaHalder,PHI Learning Pvt. Ltd.

SyllabusforUnit Test:	
UnitTest -1	UNIT– I,UNIT– II,UNIT - III
UnitTest -2	UNIT– IV, UNIT–V, UNIT-VI

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology
Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

EnergyStorageSystems		
TEACHING SCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:03	EndSemester Examination:60 Marks	Theory:03
Practical: 00	InternalAssessment:40Marks	Total:03

CoursePre-requisites:	
TheStudentsshould haveprior knowledgeof	
	BasicElectricalEngineering,EngineeringPhysics,Chemistry

Course Outcomes: Afterlearningthis coursestudentswill beableto	
1	Learnoverviewofthe subject.
2	Understandenergystorageasstructuralunit ofa power system
3	UnderstanddifferentEnergyStorageTechniques I
4	UnderstanddifferentEnergyStorageTechniques II
5	Analyzeanddomathematicalmodelofstorage devices.
6	Knowdifferent applicationsof EnergyStorageTechnology.

UNIT–I	Overviewofthe subject	**(06Hours)**
	BriefHistory,Moderneradevelopment-World&energygrandchallengesonenergystorage towards 2030, analysis of energy market, economic growth environment, and structural change in electricity supply industry. Different energydevices with comparative economics.	
UNIT-II	Energystorageasastructuralunit ofapower system	**(06Hours)**
	Generalconsiderations,Energy&powerbalanceinstorageunit,Mathematicalmodel of storage, Econometric model of storage. Storage applications: Static duties of storage plant, Storage at the user's level, Storage & transport, Dynamic duties of storage, possible applications.	
UNIT-III	EnergyStorageTechniquesI:	**(06Hours)**
	Thermal energy storage-Storage media, Containment, Power extraction, Thermal storage in power plant.2 Flywheel Energy storage System (FESS) -flywheel as a central store, Energy discharge problem, Applications 3. Pumped Hydro Energy StorageSystem(PHESS)-Powerextractionsystem,Centralstoreforpumpedhydro.4. Compressed Air Energy Storage (CAES) - Basic principle, central store, power extractionsystem,examples,Dispatchandeconomiclimitations.5.Batteries,types. BatteryEnergyStorageSystem(BESS).	
UNIT-IV	EnergyStorageTechniquesII:	**(06Hours)**
	Hydrogen & other synthetic fuels- Synthetic storage media, Hydrogen production, Storage,Thehydrideconcept.2.Electo-chemicalenergystorage-Secondarybatteries. Fuels Cells, Storage Unit Assembly, Thermal regime, Power extraction system.3. Super Capacitor Energy Storage (SCES) - Theoretical background, Principal & Operation 4. Superconducting magnetic energy storage (SMES) - Basic principles, Superconducting coils, Cryogenic systems, Power extraction, safety problems 5. Power system as a storage device- Power system as a flywheel, interconnected super grid. Comparison of different storage technique.	

UNIT -V	Modeling&AnalysisofEnergyStorageSystems	**(06Hours)**
	Batteries,FlywheelEnergyStorageSystem(FESS),SuperCapacitorEnergyStorage (SCES), Superconducting magnetic energy storage (SMES), Modelling of Power system as a storage device. Parameters & characteristics of different storage technologies.	
UNIT-VI	ApplicationsofEnergyStorageTechnology	**(06Hours)**
	Fuel cells, types, design applications. Hybrid Vehicles, Applications of ESD in Nanotechnology,Advancedpowerapplicationsof ESD,Transmission&Distribution Applications of ESD. Applications of SCES, SMES, BESS. Special Applications in Space-Vehicles.	

ProjectBasedLearningonthebroadareasofandnotlimited to

1.Computer simulationofdifferentenergystoragedevices.

2.Any casestudy fromdifferent energystoragedevices.

3.Mathematical model ofanyoneenergy storagedevices.

4.Building toymodel ofenergy storagedevices.

5.Writingreportonnew ageapplicationsofenergystoragesystems.

6.Presentoneresearchpaper onenergystoragesystem.

7.Designenergy storagesystem for aparticular application.

8.Prepare areport onfutureapplicationfor energystoragesystems.

TextBooks:

1.EnergyStorageforPowerSystem,2E,A.G.Tar-Gazarian, IETPower&EnergySeries63,PeterPeregrines Ltd, The Institute of Engineering & Technology London, UK.

2.EnergyStorage,Robert A.Huggins,Springer.DOI10.1007/978-1-4419-1024-0

3EnergyStorage,RichardBasxter,PenWellCorporation,1421SouthSheridanRoad,Tulsa,Oklahoma74112- 6600 USA.

ReferenceBooks:

1.ElectricalVehicleTechnologyExplained,JamesLarminie,JohnLowory,JohnWilly&Sonsltd.TheAtrium, Southern Gate, Chichester, West Sussex, PO19 S8Q, England.

2..LargeEnergyStorage System,FrankBarnes,JonahLevine,Tayler&FransisGroup,CRC Press.

3.EPRI-DOEHandbookofEnergy,StorageforTransmission&Distribution Applications,FinalReport, December 2003. http://www.sandia.gov.

SyllabusforUnit Test:

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

PowerSystem Planningand Restructuring		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:03Hours/ Week	EndSemester Examination:60 Marks	03 Credits
Practical:--	InternalAssessment:40 Marks	
Tutorial:--	TW:-- Oral:--	
CoursePre-requisites:		
Thestudents shouldhaveknowledgeof		
1. FundamentalsofElectricalEngineering,PowerGeneration Techniques		
Course Objectives:		
1 Tocreateawarenessofpower systemplanning		
2 Tocreateawarenessofpowersectorrestructuring		
3 Toimpartknowledgeofvariousregulatoryinstitutionsin India		
4 Toimpartknowledgeof variousfinancialinstitutionsinenergy sector		
Course Outcomes: Aftersuccessful completionofcoursestudent willbeable to		
1. Explaintheroleofvarious financialinstitutionsinenergy sector		
2. Analyzethevarious regulatoryinstitutionsintheenergy sector		
3. Estimatethe variouspower tariffsin theenergy sector.		
4 Explainthevariousregulationsinthepower sector.		
5 Analyzethevariouscostinvolvedinthepower sector.		
6 Explainthevarioustransmissionpricing methods.		
UNIT -I	**PowerSectorinIndia**	**(06 Hours)**
	IntroductiontovariousinstitutionsinIndianPowersectorsuchasCEA,Planning Commissions, PGCIL, financial institutions, PFC, Ministry of Power, state and centralgovernments,REC,CERC,MNRE,utilitiesandtheirroles.Criticalissues / challenges before the Indian power sector, Salient features of Electricity act 2003 Need of regulation and deregulation of power industry. Evolution of integrated, monopoly, state electricity boards (SEBs). Role of Load Dispatch Centers (LDCs).	
UNIT -II	**Powersectoreconomicsandregulation**	**(06 Hours)**
	Typical cost components and cost structure of the power sector, Introduction to various concepts such as capital cost, Debt and Equity, depreciation, fixed and variablecosts,workingcapital,profitabilityindices,NetPresentValue,Different methodsofcomparinginvestmentoptions,Conceptoflifecyclecost,annualrate of return , methods of calculations of Internal Rate of Return(IRR) and Net PresentValue(NPV)ofproject,Shorttermandlongtermmarginalcosts,utilities such as Return in Equity, Depreciation, Interest and Finance Charges, O&M Expenses etc and their determinants. Concepts of Subsidy and cross-subsidy. Different financing options for the power sector. Different stakeholders in the powersector,Roleofregulationandevolutionofregulatorycommissioninindia, typesandmethodsofeconomicregulation,regulatoryprocessinIndia.	
UNIT -III	**PowerTariff**	**(06 Hours)**
	Differenttariffprinciples(marginal cost,costto serve, averagecost), Consumer tariff structures and considerations, different consumer categories, telescopic tariff,fixedandvariablecharges,timeofday,interruptibletariff,different	

	tariffbased penalties and incentives etc., Subsidy and cross subsidy, life line tariff, Comparison of different tariff structures for different load patterns. Governmentpoliciesin force fromtimetotime.Effectofrenewableenergyand captivepowergenerationontariff.Determinationoftariffforrenewableenergy. Qualityofsupplyandservice,standardsofperformancebyutility,environmental andsocialconsiderations.AvailabilityBasedTariff(ABT).	
UNIT -IV	**PowerSectorrestructuringandmarket reform**	**(06 Hours)**
	Power system regulatory process in India. NonPrice issues. Service quality, consumer service, social equity Transparency and public participation in regulatoryprocessDifferentindustrystructuresandownershipandmanagement models for generation, transmission and distribution. Barriers, different types, benefits and challenges Latest reforms. Different market and trading models: Genco,Transco,Disco,Retailco,Powermarkettypes,Energymarket,Ancillary service market, transmission market, Models based on energy trading or structural models Monopoly, Single buyer, wholesale competition, Retail competition etc. Ring Fencing or Accounting separations, Models based on contractual arrangements – Pool model, bilateral dispatch, Pool and bilateral trades, Multilateral trades. Ownership models (Public Sector – State owned and municipalutilities,Co-operatives,PrivateSector,Public-PrivatePartnership). Competitionforthemarket vs.competition inthemarket.	
UNIT -V	**ElectricityMarketsandPricing**	**(06 Hours)**
	Electricity price basics, Market operation, Market efficiency, gate closure, settlement process.Market Clearing price (MCP), Zonal and location MCPs. Dynamic,spotpricingandrealtimepricing,Dispatchbasedpricing,Powerflows and prices. Optimal power flow, Spot prices for real and reactive power. Unconstrainedrealspotprices,constraintsandreal spotprices.Globalexperience withelectricityreformsindifferentcountries.Trading–Electricitymarketplaces, Rules that govern the electricity markets, Peculiarity of electricity as a commodity,Variousmodelsoftradingarrangements–Integratedtradingmodel, Wheeling trading model, Decentralized trading model. Retail Competition – Retail Access framework, competing retailers, metering and accounting issues, Technologicalaspectsofcompetition.ImpactofmarketreformonRegulation andexternalities(environment,socialequityetc.)	
UNIT -VI	**TransmissionPlanningand pricing**	**(06Hours)**
	Transmission planning, Different methods of transmission pricing, Different transmission services, Congestion issues and management, Transmission cost allocation methods, Location marginal price, Transmission ownership and control, Transmission pricing model in India, concept of arbitrage in Electricity markets, game theory methods in Power System, security constrained unit commitment. Ancillary services for restructuring, Forward ancillary service auction. Power purchase agreements. Transmission rights and pricing, different methodsoftransmissionpricing,differenttransmissionservices(ancillary services etc.) Grid codes, Transmission Ownership and Control – Transco and ISO. Transmission pricing and model in India	
Projectbasedlearning:		
1. Visittovariousfinancialinstitutionsinenergysectorandpreparationof report. 2. Visittovarious regulatoryinstitutionsin theenergysector andpreparationof report.		

3. CaseStudyofvarioustransmissionpricingmethodsof MSETCL. 4. CaseStudyoftariffforrenewableenergyofMaharashtraState. 5. CaseStudyofavailabilitybasedtariffforThermal/HydroPowerStation. 6. CaseStudyofruralelectricitycorporationinrural area. 7. Industrialvisittovariousstateelectricity boards. 8. Comparativeanalysisofvariousenergytradingmodels. 9. StudyofelectricityAct2003. 10. Roleofvarious stakeholders in the power sector. 11. CaseStudyoftelescopic tariffforanygiven consumers. 12. Studyofenergymarket. 13. Writereview paperon anysuitablesyllabus topic
TextBooks:
1. D.S.KirschenandG.Strbac, "FundamentalsofPowerSystemEconomics",JohnWiley&sons.
2.G.RothwellandTGómez,"ElectricityEconomicsRegulationandDeregulation",Wiley –Inter Science
3.SallyHunt,"MakingCompetition WorkinElectricity", 2002,JohnWiley Inc
4. EdwardKahn,"ElectricUtilityPlanningandRegulation",AmericanCouncilforEnergyEfficient Economy.
ReferenceBooks:
1."KnowYourPower",A citizensPrimerOntheElectricitySector,PrayasEnergyGroup, Pune.
2.StevenStoft,"PowerSystem EconomicsDesigningmarketsforElectricity",Wiley-interScience.
3.M. Shahidepour, Hatimyamin, Zuyi Li, "Market Operations in Electric Power Systems, Forecasting,Scheduling and Risk Management, Wiley Inter Science.
4.RegulationininfrastructureServices:Progressandthe wayforward-TERI, 2001
5.MaharashtraElectricityRegulatoryCommissionRegulationsandOrders-
6.www.mercindia.com
7.Variouspublications,reportsandpresentationsbyPrayas,Energy Group,Pune
8.www.prayaspune.org
9.Central ElectricityRegulatoryCommission,RegulationsandOrders-www.cercind.org
10.ElectricityAct2003and NationalPolicies–www.powermin.nic.
11.BhanuBhushan,"ABCofABT -Aprimeron AvailabilityTariff"-www.cercind.org

SyllabusforUnit Test:	
UnitTest-1	UNIT– I,UNIT– II,UNIT - III
UnitTest -2	UNIT– IV, UNIT–V, UNIT-VI

ElectiveI: RENEWABLE ENERGY SYSTEMS

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITS ALLOTTED:
Theory:03Hours/ Week	EndSemesterExamination:60 Marks	Theory:03Credits
Practical:00Hours/Week	ContinuousAssessment:40 Marks	
	TermWork:00Marks&Practical:00Marks	

CoursePre-requisites: TheStudentsshouldhave

1.	FundamentalsofElectricalEngineering,PowerGenerationTechniques

Course Outcomes:

1.	Usesrenewableenergy sources
2.	Utilizewind energy
3.	Applysolar energyto any equipment
4.	Describebiogasplant,mini-hydroplantandfuelcell
5.	Comparetidalenergy, waveenergy,oceanthermalandgeothermalenergy
6.	Decide energystorageandhybrid systemsforparticular application

UNIT -I	**IntroductiontoEnergySources**	**(06Hours)**
	Energy terms, parameters and characteristics of energy. Classification of energy sources, energy resources, alternative energy sources, energy scenario in Indian context. Electricitygenerationfromnon-conventionalenergysources. Environmental issues, environmental impacts, global warming and climate change, carbon trading, concept of carbon credits, carbon footprints, Kyoto protocol, ozone depletion. Concept of clean development CDM and prototype carbon funds PCF. Green building and its standards. Impacts of renewable energy, Factors favoring and against renewable energy sources.	
UNIT -II	**WindEnergy**	**(06 Hours)**
	Introduction, utilization aspects of wind energy, characteristics of wind, Advantages and disadvantages of wind energy, environmental aspects of wind energy, sources or origin of wind, principle of wind energy conversion and wind power, and wind energy pattern factor. Basic components of wind energy conversionsystems,advantagesanddisadvantagesofWECS,selectionofsitefor WECS.Ternsanddefinitions.LiftandDrag-thebasisforwindenergyconversion. Classification and description of wind mills, parameters to be considered while selectingawindmill,designconsiderationsforwindturbine,performanceofwind mills. Analysis of aerodynamic forces on a blade. Design of wind turbine rotor, numerical.Windelectricgeneratingpowerplant,generatingsystems.Economic sizeofwindturbinegenerator,windelectricityeconomics,problemsinoperating large wind power generators.	
UNIT -III	**Principlesofsolarradiation andsolarthermal systems**	**(06 Hours)**
	Solarenergy-generalaspects–sunandearth,solarenergy,advantages,limitations andapplicationsofsolarenergy.Solarenergytermsanddefinitions–solar	

	radiation, solar constant, cloudy index and concentration ratio, solar radiation geometry, solar day length, sunrise, sunset, local solar time, apparent motion of sun. Solar radiation measurements: pyranometer, pyrheliometer, sunshine recorder. Solar radiation data for India, solar insolation. Estimation of average solar radiation.Direct and diffused radiation and effect on power generation. Numerical. Solarthermalenergy,typesofcollectors,efficiency,solarthermalenergy generation.Applicationsofsolarthermalsystem,solarponds,solarcooker,issues in solar energy.	
UNIT -IV	**Solar photovoltaicsystems**	**(06 Hours)**
	Basic semiconductor physics, photovoltaic effect, the simplest equivalent circuit for a photovoltaic cell from cells to modules to arrays, the P-V, I-Vcurve under standard test conditions (STC), impacts of temperature and insolation on i–v curves, shading impacts on i–v curves. Solar photovoltaic cells – Photovoltaic materials: single-crystal silicon, ribbon silicon, cast multi-crystalline silicon, crystalline silicon modules, thin-film photovoltaic, Photovoltaic (PV) Systems: Stand alone, grid connected: Grid integration issues, case studies, data analysis, grid-connected PV system economics. grid connected and standalone system sizing, design, layout, costing, payback period. Waterpumpingsystems,lightingsystems,hybridsystems.EfficiencyofPV system.	
UNIT -V	**Othersustainableenergysourcesandhybrid systems**	**(06 Hours)**
	Micro-turbine generation, wave energy conversion systems, tidal energy conversion systems, ocean thermal energy systems, clean coal power plants, biogas, biomass to electrical energy conversion, energy from municipal solid waste, geo-thermal energy, biomechanical energy, bio-chemical and photosynthesis techniques. Biomass for electricity, small hydro, mini hydro, micro-hydropower, pico hydro, nano hydro systems, electricity from water pipelines, fuel cells, fuel cell efficiency, types of fuel cells, hydrogen production, standalone system, hybrid systems,windsolarhybrid,winddiesel,solardiesel,windminihydrohybrid system.	
UNIT -VI	**Energy storage**	**(06 Hours)**
	Battery storage, charge regulators, battery types, maintenance, management, fly wheel energy storage, pumped water energy storage, hydrogen energy storage, super capacitor energy storage systems, compressed air energy storage systems, cryogenicenergystorage,thermalenergystorage,seasonalthermalenergy storage.Useof variousenergy storagetechniques in renewableenergy sources.	
PROJECTBASED LEARNING:		

1. Market survey for solar thermal system for water heating and solar photo voltaic system for power generation. Collection of information charts brochures / leaflets from suppliers, manufacturers, cost, technical specification etc. comparative tables for techno commercial information of various products from various companies. List of solar power plants in India and nearby Pune city

2. CleandevelopmentmechanismCDM,Carboncredit,carboncreditcertificate,typesofCarbonCredits, carbon footprints,Measuring carbon footprints,Average carbon emissions per person by country

3. Variouswindgeneratorsandtheircomparisonw.r.ttechnocommercialinformation,theirsuitabilityto grid and standalone system, suitability of installation

4. Design of water pumping system for irrigation purpose using wind energy system with a 5 hp pump. Designofsuitablewaterstoragefacilityanddripirrigationsystem.Sizeofstoragetank.Detaileddesign with required techno commercial information, turbine size, tower size, cost, market survey for procurement.
5. Design of solar thermal system for hot water system for Bharati Vidyapeeth College of engineering hostelandguesthouse.Thereportshouldinvolvealltechno-commercialinformation.Completedesign of solar thermal system. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email-ID.

6. Design of solar Photovoltaic system for water pumping system for Bharati Vidyapeeth College of engineeringcampus.Thereportshouldinvolvealltechno-commercialinformation.Completedesignof photovoltaic system. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email id.

7. Detailedreportforgridintegrationandchallengesingridintegration.Recenttrendsingridintegration. Methods of grid integration for solar and wind power plants. Detailed report.

8. Design of Canteen waste management system for Bharati Vidyapeeth College of engineering canteen with detailed report for feasibility of biogas plant for cooking in canteen and possibility of generation ofelectricity.Thereportshouldinvolvealltechno-commercialinformation.Completedesignofbiogas plant for canteen waste. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email id.

9. Designoffuel cellsforaPMPMLbuswithalltechnocommercialinformation.

10. DesignofSolidwastemanagementforkatrajarea,Punecity,systemdesignanddetailedreportwithall techno commercial information and layout.

11. Designofmicrohydropowerplantforcanalandpipeddrinkingwateratparwatipumpingstationwith all techno commercial information and layout.

12. Design of nano hydro system for electrical energy generation system using kinetic energy of water through pipes in a large housing r society with suitable energy storage and illumination system using LED for parking of the society.

13. Types of storage systems for electrical energy. The storage systems suitable for wind energy, solar energy should be given. All other new unconventional methods of storage of energy along with conventionalmethodsshouldbeexplained.e.g.supercapacitors,compressedairstorage,pumpedwater storage, hydrogen energy storage etc. Techno-commercial comparison all methods should be done. Actual sites where these methods are used should also be mentioned.

14. Industrialvisitreportfor arenewableenergypowerplant.

TextBooks:

5. G.D.Rai,"Non-ConventionalEnergySources",Khanna Publication
6. R.Ramesh,"RenewableenergyTechnologies",NarosaPublication
7. S.Rao,Dr.B.B.Parulekar,"EnergyTechnology –NonConventional,Renewableand Conventional",Khanna Publication
8. Mittal,"Non-conventionalsystems",Wheelers publication

5.GilbertM.Masters,"RenewableandEfficientElectricalPowerSystems",Wiley-IEEEPress, August 2004

ReferenceBooksandPapers:

1. Dr.S.P.Sukhatme,"SolarEnergy",TataMcGrawHills
2. S.Bandopadhyay,"SolarEnergy",Universalpublishing.
3. PaulGipe,"WindEnergyComesofAge",John Wiley&SonsInc.
4. Njenkins,"Windenergy technology",Johnwileyandsons
5. Mcniels,Frenkel,Desai,"Solarandwindenergy technologies",WileyEastern
6. G.N.Tiwari,SangeetaSuneja,"SolarThermalEngineeringSystems",NarosaPublishing House
7. L.L.Freris,"Wind EnergyConversionSystem",PrenticeHall
8. MukundPatel, "Wind and solarsystems", CRC press
9. TapanBhattachary,"Solarphotovoltaicsforterrestrials
10. MiliMajumdar,"EnergyEfficientBuildingsinIndia",PublishedbyTataEnergyResearch Institute & MNRE
11. ThomasAckermann,"WindPowerinPowerSystems",WileyPublications
12. TonyBurtonetal, "WindEnergyHandBook", JohnWiley&SonsInc.
13. SiegfriedHeier,RachelWaddington,"GridIntegrationofWindEnergyConversionSystems", Wiley Publications

SyllabusforUnit Test:	
UnitTest -1	UNIT– I,UNIT– II,UNIT - III
UnitTest -2	UNIT– IV, UNIT–V, UNIT-VI

Energy Audit		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:	EndSemesterExamination:	Practical:01
Practical:02Hours/Week	InternalAssessment:	Total:01
	TW:25 Marks OR:25Marks	

CoursePre-requisites:

TheStudents should havepriorknowledgeof

Energy,electricalequipment,measurement instruments

Course Objectives:

ThiscourseisdesignedtoofferlearnersanintroductiontoEnergyaudit,itsapplicationsinindustry and at home. Learners will gain deep insights intohow energy audit is being used to save energy atindustryandathomeandappreciatewhatneedstobedonetosaveenergytotackletheproblem of energy crisis.

Course Outcomes: Afterlearningthis coursestudentswill beableto

1	Understandtheenergy audit
2	Demonstrateand applytheknowledgeofenergy audit
3	Evaluatetheperformanceofelectricalequipment
4	Applytheconceptsofenergyauditto industryandat home.
5	Evaluatetheapplicationsenergyauditindifferentindustries
6	Discusstheenergy auditandeconomyinindustry andat home.

UNIT – I	GENERALASPECTS OFENERGY MANAGEMENT	**(00Hours)**
	Currentenergyscenario-IndiaandWorld,Currentenergyconsumptionpatterninglobal Indian industry, Energy management, Energy security and reliability, Energy and environment, Need of Renewable and energy efficiency Electricity Act 2003	
UNIT -II	Energy Auditing	**(00Hours)**
	NeedofEnergyAudit,Typesofenergyaudit,Componentsofenergyaudit,Energy audit methodology, Instruments, equipment used in energy audit, energy conservation options. energy audit case studies of sugar, steel, paper and cement industries.	
UNIT -	ENERGYECONOMICS	**(00Hours)**
	Determination of cost of steam, natural gas, compressed air and electricity. FinancialAnalysisTechniquesSimplepaybackperiod,Timevalueofmoney,Net PresentValue,ReturnonInvestment,InternalRateofReturn,RiskandSensitivity analysis.	
UNIT-IV	ENERGYEFFICIENCYINTHERMAL UTILITIES	**(00Hours)**
	EnergyperformanceassessmentandefficiencyimprovementofBoilers,Furnaces, Heat exchangers, Fans and blowers, pumps, Compressors and HVAC systems., illumination system, Energy efficient motors.,	
UNIT -V	ELECTRICALENERGYMANAGEMENT	**(00Hours)**
	Electricitybilling,Powerfactorimprovement,Supplysidemanagement, Demand	

	side management, internet of energy, energy as a service, use of IoT in energy management, use of artificial intelligence in energy management, use of block chain energy management	
UNIT-VI	COGENERATIONANDWASTEHEAT RECOVERY	**(00Hours)**
	Cogeneration,Need,applications,advantages,classification,Wasteheatrecovery, Potentialforwaste-heatrecoveryinIndustry,Wasteheatrecoverydevices,Clean developmentmechanism,carboncredit,carbonfootprint,carboncreditcertificates	

Term Work:

Thetermwork shallconsistof recordofminimumeightexperimentsand notlimited to

2.EnergyauditofHVAC system
3.EnergyauditofElectrical system.
4.Compressed airorBoiler andsteam system.
5.Studyand visittoany onerenewableenergy sourceinstallation.
6.Study of solarphoto voltaicsystem
7.StudyofLeadAcidBattery asanenergy storage.
8.Performanceevaluationof blower
9.Determining efficiencyoflighting system
10.Measurementofloadandpowerfactorfortheelectricalutilities
11.Energyefficientelectricalmotors

ProjectBasedLearningonthebroadareasofandnotlimited to

1.EnergyauditofHVAC system
2.EnergyauditofElectrical system.
3.Compressed airorBoiler andsteam system.
4.Study andvisit toany onerenewableenergysourceinstallation.
5.Study of solarphoto voltaicsystem
6.StudyofLeadAcidBattery asanenergy storage.
7.Performanceevaluationof blower
8.Determining efficiencyoflighting system
9.Measurementofloadandpower factorforthe electrical utilities
10.Energyefficientelectricalmotors

TextBooks:

1.Utilization ofelectricalenergybyS.C.Tripathi,TataMcGraw Hill
2.EnergyManagementHandbook, WayneC.Turner, theFairmontPressInc.,5thEdition, Georgia.

ReferenceBooks:

1.HandbookonEnergyAuditandEnvironmentmanagement,AbbiY.A.,JainShashank,TERI Press, New Delhi, 2006
2.EnergyPerformanceassessmentforequipmentandUtilitySystems. -Vol.2,3.4BEEGovt.of India

SyllabusforUnit Test

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

BharatiVidyapeethDeemedtobeUniversity,Pune Faculty of Engineering & Technology

Programme:B.Tech(Electrical&ComputerEngineering)Sem–VIII(2021Course)

HighVoltagePowerGenerationandMeasurement		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:03	EndSemester Examination:60 Marks	Credits:03
Practical: 02	InternalAssessment:40Marks	Credit:01
	TW:25 Marks OR: 25Marks	Total:04

CoursePre-requisites:

TheStudents should haveprior knowledgeof

BasicElectricalEngineering,ElectricalPowerSystem,ElectricalMeasurement&Instrumentation.

Course Outcomes: Afterlearningthis coursestudentswill beableto

1	Describeconductionandbreakdowninsolid,liquidandgases.
2	Describegeneration ofhighDC voltageand current.
3	Learngenerationofhighalternatingvoltagesandcurrents.
4	Explainmeasurementsof highDCvoltages.
5	Explainmeasurementsof highDCcurrents.
6	Illustratedesign, planningandlayout ofhigh voltage laboratories.

UNIT – I	**Introduction:Conduction&breakdowninsolid,liquidand gases**	**06 Hours**
	Townsend's current growth equation, Current growth in the presence of secondary processes, Townsend's criterion for breakdown, Breakdown in electronegative gases. Streamers theory of breakdown in gases, Paschen's law, Classification of liquid dielectrics, , Pure liquids and commercial liquids, Conduction and breakdown in pure liquids, Conduction and breakdown in commercial liquids, Suspended particle mechanism, Cultivation and bubble theory, Breakdown in solid dielectrics, Intrinsic breakdown, Electromechanical breakdown, Breakdown due to Treeing and Tracking, Breakdownduetointernaldischarges,Thermalbreakdown,Electrochemicalbreakdown,	
UNIT -II	**Generationofhighdirectvoltagesandcurrents**	**06 Hours**
	Requirements of HV generation in Laboratory, voltage stress, testing voltages, generation of direct voltages – AC to DC conversion – single phase rectifier circuits–cascadecircuits–voltagemultipliercircuits–Cockcroft-Waltoncircuit – voltage regulation – ripple factor – Electrostatic generator. Generation of high direct current voltages, Half and full wave rectifier circuits, Voltage doublers circuits,Voltagemultipliercircuits,Electrostaticmachines,VandeGraff generator.	
UNIT -	**Generationofalternatingvoltagesandcurrents**	**06 Hours**
	Testing transformer – single unit testing transformer, cascaded transformer – equivalent circuit of cascaded transformer –resonant circuits – resonant transformer – voltage regulation. Generation of high alternating voltages, GenerationofhighfrequencyAChighvoltages,Generationofimpulsevoltages, Standard impulse wave shape,Circuits for producing impulse waves, Multistage impulse generator –Marx circuits, Generation of high impulse currents.	
UNIT-IV	**Measurementsofhigh DC Voltages**	**06 Hours**
	Measurementsofhighdirectcurrentvoltages,Highohmicseriesresistancewith	

	micro ammeter, Resistance potential dividers for dc voltages, Generating voltmeter, Measurements of high AC and impulse voltages, Series impedance voltmeter, Capacitance potential dividers and capacitance voltage transformers, Electrostatic voltmeter. Spark gaps for measurements, Sphere gap for measurements,	
UNIT -V	**Measurementsofhigh DCCurrents**	**06 Hours**
	Measurements for high direct currents, Hall generators for dc measurements, Measurements of High-Power-frequency alternating currents, Measurements of HighfrequencyandImpulsecurrents,Cathode-Ray-Oscillographforvoltageand currentmeasurements.Calibrationofthemeasuringequipment,certificationofthe equipment.	
UNIT-VI	**Design,PlanningandLayoutofHighVoltageLaboratories**	**06 Hours**
	Testfacilitiesprovidedinhighvoltagelaboratories,Activities andstudiesinhigh voltageandUHVlaboratories,Classificationofhighvoltagelaboratories,Sizeand ratingoflargesizehighvoltagelaboratories,Sizeanddimensionoftheequipment inHVlaboratories,Layoutofhighvoltagelaboratories,Highvoltagelaboratories in India and abroad, Grounding of impulse testing laboratories, Electromagnetic shielding and earth return in high voltage laboratories.	

TermWork:

Thetermwork shallconsist ofrecord ofminimumeight experimentsand notlimited to

1. Measurementofbreakdownstrengthofsoliddielectrics.
2. Measurementofbreakdownstrengthofliquid dielectrics.
3. Measurementofhighvoltageusingspheregap.
4. Study of breakdown in non-uniform fields and measurement of breakdown voltage (rod-rod, rod-plane, needle-plane gap etc.
5. Study ofcoronaandmeasurementofcoronainceptionvoltage.
6. Studyofimpulsegenerator.
7. CandtandeltameasurementwithbridgeforHVequipment.
8. Highvoltagetestingofarmoredcables.
9. Study of horn gap arrestor.
10. Measurementofhighresistivity(leakagecurrent).
11. Measurementofflashovervoltageandstudyofflashoveralongdielectricsurface(planesurface,corrugated surface)
12. Testingofsurgearrestorsgaplesstype.

ProjectBasedLearningonthebroad areasofandnotlimited to

1. CaseStudy:Inspection ofhigh voltagetransformerin yourcampus area.
2. CaseStudy: Inspectionofpolemounted substationin yourcampus area.
3. Study of high voltagetransformerin your HV laboratory.
4. Finding/measuringinsulationstrength ofsolid dielectricmaterialsin yourHV laboratories.
5. Finding/measuring insulation strengthofliquiddielectricmaterialsinyourHVlaboratories.
6. Theoreticaldesignof voltageimpulse generator.
7. Theoreticaldesign oflargescaleHV laboratories.
8. Study-Reporteffectof highvoltagesurroundingsonhuman body.

TextBooks:

1.MSNaiduandVKamraju,"HighVoltageEngineering",TMCPublishingCompanyLtd.
2.C.LWadhwa,"HighVoltageEngineering",NewAgeInternational(P)Ltd, Publishers.
3.VRazevig,Dr.MPChourasia,".HighVoltageEngineering",Khanna Publications

ReferenceBooks:

1VRazevig,Dr.MPChourasia,".HighVoltageEngineering",Khanna Publications
2.Dr.RSJha,"HighVoltageEngineering",DhanpatRaiandSons.
3.EKuffel,W,SZaengl"HighVoltageEngineeringFundamentals",PergamonPress.
4.KKuffelMAbdulla,"HighVoltageEngineering",PergamonPress.
5.DVRazevig,"HighVoltageEngineering",Khanna Publication.
6.TJGallgher,"HighVoltageMeasurement,TestingandDesign",JohnWileyPublication.
7.DieterKind,"AnIntroductiontoHighVoltageExperimentalTechniques",WileyPublication
8.AdolfJSohwab,"HVMeasurementTechnique",MITPress Cambridge
9.LLAlston,"HighVoltageTechnology",HarwellPostGraduateSeries,OxfordUniversity Press, New York.

SyllabusforUnit Test:

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

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology
Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

ComputerAidedPowerSystem Analysis		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:03	EndSemesterExamination:60Marks	Theory:-04
Practical:02	ContinuousAssessment:40Marks	Practical:-01
Tutorial:01	TW:25Marks,OR:25Marks	Total: -05

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

FundamentalsofElectricalEngineering,PowerSystemGeneration,ApplicationSoftwaresinElectricalEngineering, Computational Algorithms.

CourseObjectives:

- Tocreateawarenessofloadflow studies
- ToimpartknowledgethreephaseloadflowandACDCloadflow
- Toimpartknowledgeofpowersystem security
- Tocreateawarenessoffaultanalysis
- Toimpartknowledgeofoptimalpowerflowanalysis

CourseOutcomes: Studentswillbeableto

1.	Explorevariouscomponentsinthepowersystem.
2.	AnalyzeandMonitortheLoadflow.
3.	UnderstandtheAC-DCloadflowmethodology.
4	Analyzeandestimatetheseverityoffaultandprovidenecessarysolutionto it.
5	Understandoptimalpowerflowanalysisbydefining objectives.
6	Exploretheconceptofpowersystemsecurityandcontingencyanalysis.

UNIT-I	**PowerSystemComponentsandModeling:**	**(08 Hours)**
	Digitalcomputersinpowersystemsimulations,natureandscopeofpowersystemstudies, Power system components and their modeling, modeling of transmission lines. Transformers - Two winding andauto-transformers,tap changing transformer,generators, andloads,BusReferenceFrame:InjectionsandLoads,Busadmittancematrix,Bus admittancematrixwithmutualimpedance.	
UNIT-II	**LoadFlowStudies:**	**(08 Hours)**
	PowerFlowequations,classificationofbuses,GaussSeidelLoadFlow,GaussSeidelLoad Flowwithmultiplegenerators,Newton-RaphsonmethodinPolarandRectangular coordinate, Fast Decoupled Load flow.	
UNIT-III	**AC-DCLoadFlow Studies:**	**(08Hours)**
	Introduction,SimultaneousandSequentialapproachinAC-DCloadflow,Equationsfor HVDC link, Equations, Unknown variables, cases for specified variables in AC-DC load flow.	
UNIT-IV	**FaultAnalysis:**	**(08 Hours)**
	Introduction to faults, Formation and derivation of admittance bus matrix for unbalanced network, Representation of transmission line (3- phase), fault admittance matrix for differenttypesoffault(L-G,L-L,L-L-G),procedureforevaluatingvoltageateachbus after the occurrence of a fault, method for evaluating bus admittance matrix for different types (4 types) of transformer connection.	
UNIT-V	**OptimalPowerFlow Analysis:**	**(08 Hours)**

	Optimal power flow:concepts,active/reactive power objectives(Economic dispatch, MW and MVAr loss minimization) – applications- security constrained optimal power flow.	
UNIT-VI	**PowerSystemSecurityandContingencyAnalysis:**	**(08 Hours)**
	Conceptofsecurity,operatingstatesofpowersystem,preventivestate,restorativestateand emergency state, state transition diagram, security monitoring and state estimation, major components of security assessment, on-line security assessment, major components of online security analysis, security analysis, static security assessment (SSA) and transient security assessment (TSA),contingency analysis, algorithm for contingency analysis Techniquesofcontingencyevaluation,linearsensitivityfactors,generationoutage sensitivityfactor(GOSF),lineoutagesensitivityfactor(LOSF).	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperiments:

1. RepresentationofSinglelinediagramofpowersystemUsingETAP
2. ACLoadflowstudiesusingETAP
3. AC-DCLoadflowstudiesusingETAP
4. Toperformshortcircuitanalysisusing ETAP
5. FaultAnalysisusingETAP
6. TransientStabilityAnalysisusing ETAP
7. MotorAccelerationAnalysisusingETAP
8. Studyofonlinesecurityassessmentandmajorcomponentsofonlinesecurityanalysis
9. Studyofalgorithmforcontingencyanalysis
10. Studyofstatetransitiondiagram

Projectbasedlearning:

- CaseStudyforanyoneanalysis(loadflow,shortcircuit,transient,motoracceleration).
- Articlerelatedtocourse topic.
- DetailedpowersystemanalysisusingsuitablemoduleinETAP.

Text Books:

1.R.N.Dhar,"ComputerAidedPowerSystemOperationandAnalysis",TataMcGrawHillNewDelhi.

2.M.A.Pai,"ComputerTechniquesinPowerSystemAnalysis-,TataMc-GrawHillNew Delhi.

3.StaggandEl.Abiad,"ComputerMethodsinPowerSystemAnalysis-,Mc-GrawHill(InternationalStudent Edition.)

ReferenceBooks:

1.J.Arrilinga,C.P.Arnold,"ComputerAnalysisofPowerSystems",WielyEasternLtd.

2.S.S.Rao,"OptimisationTechniques",WielyEasternLtd,NewDelhi.

3.NagrathandKothari,"ModernPowerSystemEngineering",TataMcGrawHill.

4.OlleElgerd,"ElectricalEnergySystemTheory–anintroduction-TMHPublishingCompany,NewDelhi.

5.D.P.Kothari,J.S.Dhillon,"PowerSystemOptimization-, PHI.

6.AllenWood,"PowerGenerationOperationandControl",WileyPublications.

SyllabusforUnitTest:

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

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology
Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

ComputerNetworks*		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTTED:**
Theory:04	EndSemesterExamination:60Marks	Credits: 04
Practical:02	InternalAssessment:40Marks	Credit: 01
	TW:25Marks OR:25Marks	Total:05

CoursePre-requisites:	
TheStudentsshouldhavepriorknowledgeof	
	Computersystems,itsapplicationsandOperatingsystems
CourseObjectives:	
	The Course emphasis on theoreticalconcepts and practical aspects ofnetworking.The course enables thestudents to understand the networking hardware & concepts through using network simulators.

CourseOutcomes: Afterlearningthiscoursestudentswillbeableto	
1	Demonstratetheknowledgeofcomputernetworking
2	Elucidatethesstructureofphysicalanddatalinklayers
3	DemonstratetheknowledgeofaboutNetworkandTransport Layers
4	DescribetheSessionandPresentationLayers
5	IllustratethefunctionalityofApplicationlayer
6	Understandthefundamentalsofwirelessnetwork.

UNIT–I	**INTRODUCTIONTONETWORKINGANDPHYSICALLAYER**	**(08Hours)**
	Historyofnetworkandinternet,needofnetwork,Typesofnetworks,Networkinghardware, Information transmission, Transmitter, Receiver, Introduction to networking applications and simulators, Protocol Layering — TCP/IP Protocol suite — OSI Model — Physical Layer:Performance—Transmissionmedia—Switching—Circuit-switchedNetworks— Packet Switching.	
UNIT-II	**DATA-LINKLAYER&MEDIAACCESS**	**(08Hours)**
	Introduction — Link-LayerAddressing — DLCServices —Data-LinkLayer Protocols— HDLC—PPP—MediaAccessControl—WiredLANs:Ethernet—WirelessLANs— Introduction—IEEE802.11,Bluetooth—ConnectingDevices.	
UNIT-III	**NETWORKLAYER&TRANSPORTLAYER**	**(08Hours)**
	Network Layer: Network Packet structure and formation, routing algorithms, congestioncontrolalgorithms,qualityofservice,IPAddressing,Subnets,configuringnetworksettings, Networkproblemsolving.TransportLayers:Segmentation,Congestioncontrol,Connection oriented and connection less services, Network and Transport Layer Protocols	
UNIT-IV	**SESSIONANDPRESENTATIONLAYERS**	**(08Hours)**
	Session Layer: Session management, synchronization, Dialog control, Presentation Layer: Encryption-decryption,Compression,Fileformats,Translation,SessionandPresentation Layerprotocols,SessionandPresentationLayerprotocols.	
UNIT-V	**APPLICATIONLAYER**	**(08Hours)**
	DNS,URL,DataCacheandstreaming,WebApplications,Webbrowserworking,Cloud	

	services,UserinterfaceandUserinteraction,Mailsystems,Supportoffileformats,Application Layer protocols	
UNIT-VI	**NETWORKSECURITY**	**(08Hours)**
	Firewall,TypesofFirewalls,Cryptography,SymmetricKeyAlgorithm,PublicKeyAlgorithm,DigitalSignatures,PublicKeyManagement,CommunicationSecurity, Authenticationprotocols.	

TermWork:

1.IntroductiontoComputerNetworkandNetworkSimulators.Networkingdevices,Addresses,NetworkSecurity, Internet working, Network Simulators: Cisco Packet Tracer, Netemul, NetSim.

2.NetworkconfigurationofPCsandothernetworkingdevicesusingnetworksimulators.Observingandconfiguring PCs, Routers, Switch, Hub, and other networking devices using network simulators

3.Establishment ofsimpleLANnetworkusingrealtimedevicesandnetwork simulators.

4.EstablishmentofsimpleLANnetworkusingactualdeviceslikePCs,Switch,Routerandthroughnetwork simulators

5.Establishingnetworktobroadcasttheinformationusingnetworksimulator.UseofPCs,SwitchandHubinthe network simulator.

6.Establishmentofdifferentnetworksandcommunicationbetweenusingactualdeviceslike PCs,Switch,Router and through network simulators

7.UnderstandingTransportLayerprotocolsTCP,UDPusingnetworkingsimulators

8.StudyofNetworkDevicesinDetail

9.ConnectthecomputersinLocalArea Network.

10.Establishmentofwirelessnetworkingusingactualdevicesandvianetworksimulator.UseofLaptopsandWifi Router.

ProjectBased Learning

1.IP basedpatientmonitoringsystem

2.ConfiguringInternetRouter

3.ConfiguringNetwork Switch

4.HomeAutomationsystemusingWi-Fi

5.WirelessWeathermonitoringsystemusingRaspberrypi.

6.SmartTrafficcontrolsystem

7.Smart energymeterforhomes

8.Analysis ofIPv4/IPv6protocols

9.WebSystem Security.

10..PersonalizedWebSearchwithLocation Preferences

Text Books:

1.Dataandcomputercommunications,WilliamStallings,10thedition,Pearson

2.Computernetworking:atop-downapproach,Jamesf.Kurose,Keithw.Ross,6thedition,Pearson.

3.ComputerNetworks,Tanenbaum,5thEdition, Pearson

ReferenceBooks:

1.Datacommunication&networking,Forouzan,5thedition,McGraw-Hill

2.ComputerNetworkingBeginnersGuide,RussellScott,1stedition,StefanoCardinale

SyllabusforUnitTest:

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

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology

Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

AdvancedJavaProgramming		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:03
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25MarksOral:25Marks	Total:04

CoursePre-requisites:

1.studentsareexpectedtohaveagoodunderstandingofbasiccomputerprinciples.

2. Studentsshouldhavebasicknowledgeofbasicsofcomputerprogramminglanguages.

Courseobjectives:

CourseOutcomes:

Thestudentswillbeableto

1.	
2.	
3.	

Topicscovered

UNIT-I	**CollectionandGeneric** Introduction to Generics , Generics Types and Parameterized Types, WildCards , Java CollectionFramework,Collections(BasicOperations,BulkOperations,Iteration)List,Set, Maps Lambda Expressions - Lambda Type Inference, Lambda Parameters, Lambda Function Body, Returning a Value,From a Lambda Expression, Lambdas as Objects. Self learning topics Collection Queues and Arrays	**(06Hours)**
UNIT-II	**IntroductionJavaEEProgramming** JSP Architecture, JSP building blocks, Scripting Tags,implicit object,Introduction to Bean,standardactions,sessiontrackingtypesandmethods.CustomTags,IntroductiontoJSP StandardTagLibrary(JSTL)andJSTLTags.SelflearningtopicsSimpleApplicationusing Servlet	**(06Hours)**
UNIT-III	**Spring Frameworks** Introduction to Spring Framework,POJO Programming Model, Lightweight Containers(Spring IOC container, Configuration MetaData, Configuring and using the Container) Dependency Injection with Spring- Setter Injection, Constructor Injection, CircularDependency,OverridingBean,AutoWiringBeanLooksup,SpringManageBeans) Self learning topics Bean Definition Profiles	**(06Hours)**
UNIT-IV	Spring and AOP AspectOriented Programming with Spring, Types of advices, Defining Point Cut Designator,Annotations. Self learning topics AspectJ	**(06Hours)**
UNIT-V	**FileHandlingandDictionaries** JDBC Data Accesswith SpringManaging JDBC Connection, Configuring Data Source to obtainJDBCConnection,DataAccessoperationswithJdbcTemplateandSpring,RDBMS operationclasses,ModellingJDBCOperationsasJava ObjectsSelflearningtopicsJDBC Architecture and basic JDBC Program using DML operation	**(06Hours)**
UNIT-VI	**GettingStartedwithSpringBoot** SpringBootandDatabase,SpringBootWebApplicationDevelopment,SpringBoot RESTfulWebServices.SelflearningtopicsUnderstandingTransactionManagementin Spring	**(06Hours)**

ListofPractical'stobeperformedinthelaboratory:

1.	ProgramthatdemonstratesGenericClassesandmethods
2.	Javaprogramthat**JavaEEProgramming**
3.	JavaprogrammingforfilehandlingwithJDBCconnectivity

4.	JavaapplicationprogramforSpring boot
5.	JavaapplicationprogramforSpringframework
6.	JavaApplet programming
7.	JavaapplicationprogramforRESTfulWebservices
8.	JavaapplicationprogramforJSPStandardTagLibrary(JSTL)andJSTLTags.
Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	
Projectbasedlearning: Studentshalldemonstrateminimumoneconceptbasedoonsyllabustopic.	
Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	
ReferenceBooks:	
1.	CompleteReferenceschildt,HerbertMcgrawHillEducation,NewDelhi,ISBN:9789339212094
2.	JAVA2ProgrammingBlackBook,Holzner,Stevenetal.,DreamtechPress,NewDelhiISBN10:817722655X/ISBN 13:9788177226553
3.	JavaServerProgrammingTutorialJAVAEE6Blackbook,kogentlearningsolutions,DreamtechPress,new delhi,ISBN:978-81-77222-937-0
4.	Balaguruswamy,E.(2014).ProgrammingwithJAVA:APrimer.5thedition.India:McGrawHill
5.	Education2.Horstmann,C.S.(2017).CoreJava -Vol.I–Fundamentals(Vol.10).Pearson Education
6.	**SpringBootinAction1stEditionbyCraigWalls(Author)**
7.	**SOFTWARE/LEARNING WEBSITES** a) https://www.tutorialspoint.com/java b) http://nptel.ac.in/courses/106105084/30 c) https://www.javatpoint.com/servlet-tutorial d) https://www.tutorialspoint.com/servlets e) https://www.javatpoint.com/free-java-projects f) http://1000projects.org/java-projects.html

UnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology

Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

AdvancedC#.NetProgramming		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:03
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25MarksOral:25Marks	Total:04

CoursePre-requisites:

1.Studentsareexpectedtohaveagoodunderstandingofbasiccomputerprinciples.

2.Studentsshouldhavebasicknowledgeofbasicsofcomputerprogramminglanguages.

Courseobjectives:

1.TolearnbasicprogramminginC#andtheobjectorientedprogrammingconcepts.

2.ToupdateandenhanceskillsinwritingWindowsapplications,ADO.NETandASP.NET.

3.Tostudytheadvancedconceptsindataconnectivity,WPF,WCFandWWFwithC#and.NET 4.5.

4.Tounderstandtheworkingofbaseclasslibraries,theiroperationsandmanipulationofdatausingXML.

5.Toimplementmobileapplicationsusing.Netcompactframework

CourseOutcomes:

Thestudentswillbeableto

1.	WritevariousapplicationsusingC#Languageinthe.NETFramework.
2.	Developdistributedapplicationsusing.NETFramework.
3.	Developdistributedapplicationsusing.NETFramework.

Topicscovered

UNIT-I	**C#LANGUAGEBASICS** .NetArchitecture-CoreC#-Variables-DataTypes-Flowcontrol-ObjectsandTypes-Classes and Structs - Inheritance- Generics – Arrays and Tuples - Operators and Casts - Indexers	**(06Hours)**
UNIT-II	**C#ADVANCEDFEATURES** Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions - Reflection	**(06Hours)**
UNIT-III	**BASECLASSLIBRARIESANDDATAMANIPULATION** Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML-SAXandDOM-ManipulatingfilesandtheRegistry-Transactions-ADO.NET-Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF).	**(06Hours)**
UNIT-IV	**WINDOWBASEDAPPLICATIONS,WCFANDWWF** Windowbasedapplications-CoreASP.NET-ASP.NETWebforms-WindowsCommunication Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities – Workflows	**(06Hours)**
UNIT-V	**.NETFRAMEWORKANDCOMPACTFRAMEWORK** Assemblies-Sharedassemblies-Custom Hosting withCLRObjects-Appdomains-Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices	**(06Hours)**
UNIT-VI	**ApplicationDomains** Remoting – Leasing and Sponsorship - .NETCodingDesign Guidelines–Assemblies–Security–ApplicationDevelopment–WebServices-BuildinganXMLWebService-WebServiceClient–WSDLandSOAP–WebService with Complex Data Types – Web Service Performance.	**(06Hours)**

ListofPractical'stobeperformedinthelaboratory:

1.	To understand about basics of C# and execute simple c# programs to perform the following actions: (a) CalculateHypotenuseoftriangleusingdynamicinitializationofvariables(b)Togetinputfromtheuserand

	perform calculations(c) Calculatethequadrantforthecoordinatesusingif..else…ladder(d)Checkwhetherthe alphabet is a vowel or not using switch..case… (e) To understand about for..each loop and strings
2.	TodevelopaC#applicationtoprintthestudentslistusingclassesandobjects
3.	TodevelopaC#applicationtoimplementinheritanceconcepts(a)SingleInheritance(b)Multilevel Inheritance (c) Multiple Inheritance
4.	Todevelopaconsoleapplicationtoimplementoperatoroverloadingconceptin C#(a)UnaryOperator Overloading (b) Binary Operator Overloading
5.	TodevelopaC#consoleapplicationtoimplementthreadingconcepts
6.	Todevelopac#consoleapplicationtoimplementthefollowingconcepts:(a)Delegates(b)Events
7.	TodesignawindowbasedapplicationusingC#codein VB.Net
8.	Toimplementvalidatingdataenteredincontrolsusing(a)Windowsbasedapplication –Manualcodingfor validation (b) Web based application – Validation Controls
9.	Todesignanotepadapplicationtoimplementmenus,customdialogboxandMDIconcepts
10.	Todesignwindowsbasedapplicationtoretrievedatafrom SQLdatabaseandtoworkwithdisconnected environment in ADO.Net using C#
Note:Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	
Projectbasedlearning:Studentshalldemonstrateminimumoneconceptbasedoonsyllabustopic.	
Note:Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	
ReferenceBooks:	
1.	1.ChristianNagel,BillEvjen,JayGlynn,KarliWatson,MorganSkinner.—ProfessionalC#2012and.NET4.5‖,Wiley, 2012.
2.	HarshBhasin,—ProgramminginC#‖,OxfordUniversityPress,2014.
3.	1.IanGariffiths,MathewAdams,JesseLiberty,—ProgrammingC#4.0‖,O_Reilly,FourthEdition,2010.
4.	AndrewTroelsen,ProC#5.0andthe.NET4.5Framework,Apresspublication,2012.
5.	AndyWigley,DanielMoth,PeterFoot,—MobileDevelopmentHandbook‖,MicrosoftPress,2011.
UnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology
Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

Elective-IIArtificialIntelligence		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:03
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25MarksPractical:25Marks	Total:04

CoursePre-requisites:

:ProgrammingandProblemsolvingusingpython,DataStructuresandAlgorithms

Courseobjectives:

1. StudyaboutuninformedandHeuristicsearchtechniques.
2. Learntechniquesforreasoningunder uncertainty
3.IntroduceMachineLearningandsupervisedlearningalgorithms
4. Studyaboutensemblingandunsupervisedlearningalgorithms
5. Learnthebasicsofdeeplearningusingneuralnetworks

CourseOutcomes:

Thestudentswillbeableto

1.	Useappropriatesearchalgorithmsforproblem solving
2.	Applyreasoningunder uncertainty
3.	Buildsupervisedlearningmodels
4.	Buildensemblingandunsupervisedmodels
5.	Builddeeplearningneuralnetworkmodels

Topicscovered

UNIT-I	**IntroductiontoPython:** IntroductiontoArtificialIntelligence,FoundationsofArtificialIntelligence,History of ArtificialIntelligence,RisksandBenefitsofAI,IntelligentAgentsanditstypes,Agentsand Environments, Nature of Environments, Structure of Agents.	**(06Hours)**
UNIT-II	**PROBLEMSOLVING** Heuristic search strategies – heuristic functions. Local search and optimization problems – localsearchincontinuousspace–searchwithnon-deterministicactions–searchinpartially observable environments – online search agents and unknown environments.	**(06Hours)**
UNIT-III	**GAMEPLAYINGANDCSP** Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochasticgames–partiallyobservablegames.Constraintsatisfactionproblems –constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.	**(06Hours)**
UNIT-IV	**LOGICALREASONING** Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntaxandsemantics–knowledgerepresentationandengineering–inferencesinfirst-order logic – forward chaining – backward chaining – resolution.	**(06Hours)**
UNIT-V	**PROBABILISTICREASONING** Actingunderuncertainty–Bayesianinference–naïveBayesmodels.Probabilisticreasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.	**(06Hours)**
UNIT-VI	**FuturePlanningwithAI** Automated Planning, Classical Planning, Algorithmsfor Classical Planning, Heuristics for Planning,HierarchicalPlanning,PlanningandActinginNondeterministicDomains,Time, Schedules, and Resources, Analysis of Planning Approaches, Limits of AI, Ethics of AI, Future of AI, AI Components, AI Architectures.	**(06Hours)**

ListofPractical'stobeperformedinthelaboratory:

1.	ImplementationofUninformedsearchalgorithms(BFS,DFS)

2.	ImplementationofInformedsearchalgorithms(A*,memory-boundedA*)
3.	ImplementnaïveBayesmodels
4.	ImplementAstar(A*)Algorithmforanygamesearchproblem.
5.	ImplementAlpha-BetaTreesearchforanygamesearchproblem
6.	ImplementasolutionforaConstraintSatisfactionProblemusingBranchandBoundandBacktrackingforn- queens problem or a graph coloring problem.
7.	ImplementGreedysearchalgorithmfor:SelectionSort•MinimumSpanningTree Prim's Minimal Spanning Tree Algorithm
8.	ImplementGreedysearchalgorithmfor:•Single-SourceShortestPathProblem•JobScheduling Problem•
9.	ImplementGreedysearchalgorithmfor:•Kruskal'sMinimalSpanningTreeAlgorithm•Dijkstra'sMinimal Spanning Tree Algorithm
10.	Developanelementarychatbotforanysuitablecustomerinteractionapplication

Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.

Projectbasedlearning: Studentshalldemonstrateminimumoneconceptbasedoonsyllabustopic.

1. ImplementanyoneofthefollowingExpertSystemInformationmanagement
2. Hospitalsandmedicalfacilities
3. Helpdesksmanagement
4. Employeeperformanceevaluation
5. Stockmarkettrading
6. Airlineschedulingandcargoschedules

Note: Thetermworkshallbethe recordofminimumeightexperimentsperformedfromtheabovelist.

ReferenceBooks:

1.	1.StuartRussellandPeterNorvig,“ArtificialIntelligence:AModernApproach”,Thirdedition,Pearson,2003, ISBN :10: 0136042597
2.	DeepakKhemani,“AFirstCourseinArtificialIntelligence”,McGrawHillEducation(India),2013,ISBN:978- 1-25-902998-1
3.	ElaineRich,KevinKnightandNair,“ArtificialIntelligence”,TMH,ISBN-978-0-07-008770-5
4.	NilssonNilsJ,“ArtificialIntelligence:AnewSynthesis”,MorganKaufmannPublishersInc.SanFrancisco,CA, ISBN: 978-1-55-860467-4
5.	AndriesP.Engelbrecht-ComputationalIntelligence:AnIntroduction,2ndEdition-WileyIndia-ISBN:978-0- 470-51250-0
6.	PatrickHenryWinston,“ArtificialIntelligence”,Addison-WesleyPublishingCompany,ISBN:0-201-53377-4

UnitTest:

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

Industry4.0

TEACHINGSCHEME:	EXAMINATIONSCHEME:	CREDITSALLOTTED:
Theory:03Hours/Week	EndSemesterExamination:60Marks	Credits:03
Practical:02Hours/Week	InternalAssessment:40Marks	Credit:01
	TW:25Marks OR:25Marks	Total: 04

CoursePre-requisites:

TheStudentsshouldhaveprioriknowledgeof

Computersystem,energyandsmartautomation

CourseObjectives:

Thiscourseisdesignedtoofferlearnersanintroductiontoindustry4.0,itsapplicationsinthe businessworld.Learnerswillgaindeepinsightsintohowsmartnessisbeingharnessedfromdata and appreciate what needs to be done in order to overcome challenges.

CourseOutcomes: Afterlearningthiscoursestudentswillbeable to

1	UnderstandtheconceptofIndustry4.0
2	DemonstrateandapplytheknowledgeofIndustry4.0
3	Evaluatethesmartenergysources
4	ApplytheconceptsofIndustry4.0toSmartsystems
5	EvaluatetheapplicationsofSmartGrid
6	DiscussthepowerofCloudComputinginanetworked economy

UNIT–I	INTRODUCTIONTOINDUSTRY 4.0	**(06 Hours)**
	Introduction,HistoricalContext,Generalframework,Applicationareas,DisseminationofIndustry 4.0 and the disciplines that contribute to its development, Artificial intelligence, The Internet of ThingsandIndustrialInternetofThings,Additivemanufacturing,Robotizationandautomation, CurrentsituationofIndustry4.0.IntroductiontoIndustry4.0toIndustry5.0Advances	
UNIT-II	INDUSTRY4.0ANDCYBERPHYSICALSYSTEM	**(06 Hours)**
	Introduction to Cyber Physical Systems (CPS), Architectureof CPS-Components, DatascienceandtechnologyforCPS,EmergingapplicationsinCPSindifferent fields.Casestudy:ApplicationofCPSinhealthcaredomain.	
UNIT-III	SMARTENERGYSOURCES	**(06 Hours)**
	Energy Storage for Mitigating the Variability of Renewable Electricity Sources- Types of electric energy storage, Potential of Sodium-Sulfur Battery Energy StoragetoEnableIntegrationofWind-Casestudy.ElectricVehiclesasEnergy Storage:V2GCapacityEstimation.	
UNIT-IV	SMARTGRID	**(06 Hours)**
	SmartgriddefinitionanddevelopmentSmartGrid,UnderstandingtheSmart Grid,Smartgridsolutions,DesignchallengesofsmartgridandIndustry4.0.	
UNIT-V	SMARTAPPLICATIONS	**(06 Hours)**
	UnderstandingSmartAppliances-SmartOperation-SmartMonitoring-Smart EnergySavings-SmartMaintenance,Casestudy-SmartCars,Self-DrivingCars,	

	IntroducingGoogle'sSelf-DrivingCar,IntellectualPropertyRights.	

UNIT-VI	Communicationsystemsandstandardsforlndustry4.0andcloudapplications	**(06 Hours)**
	IndustrialcommunicationIndustrialInternetofThings(IIOT)TheIndustry4.0 Reference Architecture ModelVirtualization • Cloud Platforms • Big data in production•Cloud-basedERPandMESsolutions•Connectedfactory applications• ITsecurityforcloud applications	

TermWork:

Thetermworkshallconsistofrecordofminimumeightexperimentsandnotlimitedto
TobedecidedwithIndustry experts

11. EfficientProductionmodel
12. ComponentsasinformationCarriers
13. EfficientProductionProjectStructure&Goals
14. AdditiveManufacturingMonitoringaManufacturingProcess
15.
16.
17.
18.

ProjectBasedLearningonthebroadareasofandnotlimitedto

1. InetrnetofThings(IoT)
2. BigData
3. CloudComputing
4. AugmentedrealitywithAI
5. Cybersecuritywithblockchain
6. AutonomousRobot
7. Systemintegration
8. AdditiveManufacturing

TextBooks:

5. Jean-ClaudeAndré,—Industry4.0‖,Wiley-ISTE,July2019,ISBN: 781786304827,2019.
6. DiegoGalarPascual,PasqualeDaponte,UdayKumar,—HandbookofIndustry4.0andSMART Systems‖TaylorandFrancis,2020
7. MillerM,—Theinternetofthings:How smartTVs,smartcars, smarthomes,andsmartcitiesare changingtheworld,PearsonEducation,2015,ISBN: 9780134021300.

ReferenceBooks:

5. PengweiDuandNingLu,—Energystorageforsmart grids:planningandoperationforrenewable and variable energy resources VERs ‖, Academic Press, 2018, Reprint edition , ISBN-13:978-0128100714
6. HossamA.Gabbar,—SmartEnergyGridEngineering‖,AcademicPress,2017,ISBN978-0-12-805343-0.
7. MiniS.Thomas,JohnDouglasMcDonald,—PowerSystemSCADAandSmartGrids‖,CRCPress, 2017.

SyllabusforUnitTest:

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

PHP

TEACHING SCHEME:	EXAMINATIONSCHEME:	CREDITS ALLOTTED:
Theory:03Hours/ Week	EndSemester Examination:60 Marks	Theory:03Credits
Practical:02Hours/Week	ContinuousAssessment:40 Marks	Practical:01 Credit
	TermWork:25Marks &Oral:25 Marks	Total:04 Credit

CoursePre-requisites: TheStudentsshouldhaveknowledgeof

1.	Datastructurewith Cand Objectoriented programmingwith C++
2.	Databasemanagement system

Course Outcomes:

1.	Explorethe basic knowledgeand of the componentsPHP.
2.	Understandthe variousfunctions ofPHP alongwith working.
3.	Understandthevarious forms ofPHP operations
4.	Analyzeandunderstandthe statemanagementandsending emails.
5.	Understandthevariousstringmatching operations.
6.	Exploretherequirementsofdatabaseconnectionsespecially MySQL.

UNIT -I	**PHP Basics**	**(06Hours)**
	PHP: Versions of PHP, Installation of PHP, Php.ini basics. Testing Installation. BuildingBlocksofPHP:Variables,datatypes,Operators&Expressions, Constants,Switching,Flow,Loops,CodeBlocksandBrowser Output.	
UNIT -II	**Functions&Working**	**(06Hours)**
	Functions:Meaning,Calling,Definingafunction.Returnvaluefromuserdefined function.Savingstatewith'static'function.Arrays:Creatingarrays,Arrayrelated functions.WorkingwithString,Date&Time:FormattingStringwithPHP,Using Date and time Functions with PHP.	
UNIT -III	**Forms**	**(06Hours)**
	Forms: Creating simple input Form. Accessing Form input with user defined arrays, HTML and PHP Code on a single page. Redirecting User. Working with File Upload. Uploading & Downloading.	
UNIT -IV	**StateManagement&Emails**	**(06Hours)**
	Statemanagement:Usingquerystring(URLrewriting),UsingHiddenfield,Using cookies, Using session. Email:SendingEmail,Headers,ReviewingSMTP,PHPMailer,Building Notifications	
UNIT -V	**StringMatching**	**(06Hours)**
	Stringmatchingwithregularexpression:Whatisregularexpression,Pattern matching in Php, Replacing text, Splitting a string with a Regular Expression.	
UNIT -VI	**Connectingto Database**	**(06Hours)**
	Connecting to the MYSQL: Selecting a database, Adding data to a table, Displaying returned data on Web pages, Inserting data, Deleting data, Entering and updating data, Executing multiple queries.	

TERMWORK:(Studentsshouldperformatleast08experimentsfromthe followinglist)

1. Getnameof theuser fromaform and showgreeting text.
2. WriteaPHP program tocheck whethergiven numberis palindromeor not.
3. WriteaPHP program tocheck whethergiven numberis Armstrongor not.
4. WriteaPHPprogram to findlargest values oftwo numbers usingnesting offunction.
5. WriteaMathematical calculatorprogram.
6. WriteaAgecalculatorprogram.
7. WriteaPHP program tocheck whethergiven numberis String palindromeor not.
8. WriteaPHP program using function.
9. CreateaPHP pagefor login pagewithout sql connection.
10. WriteaPHPprogramtoArray manipulation.
11. WriteaPHPprogram todesignpersonal information

PROJECTBASED LEARNING:

1. CreateaPHP pagefor login pagewith sql connection.
2. WriteaPHP programtoRead fromexisting file.
3. WriteaPHP programto Writeafile
4. WriteaPHPprogramtocalculate DateandTimefunction.
5. WriteaPHPprogram todesign Curriculum Vitae.
6. WriteaPHP programhit counter using cookies.
7. Createa web pagetoadvertise aproduct of the company using images and audio.
8. CreateawebpageforTravelagency.
9. Createawebpageforsoftwarecompanywesites.
10. CreateaPHPpagefor loginsystem using session.

TextBooks:

1. Deitel,DeitelandNieto:Internet&WWW.How toprogram,2ndEdition,PearsonEducationAsia.
2. TeachYourselfPHP,MYSQL&ApacheByMeloni,Pearson Education.
3. Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl & PHP By James Lee, Pearson Education.
4. PHP:ABeginner'sGuideByVaswani,VikramTataMc-GrawHill.

WebResource:

http://www.mysqltutorial.org/mysql-stored-procedure-tutorial.aspx

SyllabusforUnit Test:	
UnitTest -1	UNIT– I,UNIT– II,UNIT - III
UnitTest -2	UNIT– IV, UNIT–V, UNIT-VI

PERL		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:03 Hours/ Week	EndSemester Examination:60 Marks	03 Credits
Practical:02Hours/Week	InternalAssessment:40Marks	01 Crdit
Tutorial:--	TW:--25Marks Oral:--25Marks	
CoursePre-requisites:		
Thestudents shouldhaveknowledgeof		
1.	FundamentalsofElectricalEngineering,PowerGenerationTechniques	
CourseObjectives: Everystudent willbe able		
1	Tounderstandimportance of Perlprogramming	
2	Todemonstrateandpracticetheperlprogramming.	
Course Outcomes: Aftersuccessful completionofcoursestudent willbeable to		
1.	IdentifytheneedofPerlprogramming.	
2.	Demonstrateperlprogrammingwithscalardata	
3.	Demonstrateperlprogrammingwitharraysandlists	
4	Demonstrateperlprogrammingwithsubroutines.	
5	Demonstrateperlprogrammingwithinput,outputandhashes.	
6	Demonstrateperlprogrammingwithregularexpressions.	

UNIT -I	*IntroductiontoPerl*	**(06 Hours)**
	Introduction,GettingandInstallingPerl,CreatingaFirstPerlProgram, More Advanced Perl Examples	
UNIT -II	*WorkingwithScalarData*	**(06 Hours)**
	Introduction, Working with Scalar Data, Working with strings, Working with numbers, Working with variables, Getting user input, The chomp operator, Decision-making with if statements, Looping with while statements	
UNIT -III	*WorkingwithArraysandLists*	**(06 Hours)**
	Introduction, Creating arrays, Accessing arrays via indices, Creating lists, Performing assignment with lists, Converting arrays into strings, Using the foreach loop on arrays and lists, Understanding scalar and list context, Understanding <STDIN> in scalar context	
UNIT -IV	*WorkingwithSubroutines*	**(06 Hours)**
	Introduction, Subroutine definitions, Calling subroutines, Working with subroutinereturnvalues,Subroutinearguments,Usingvariable-lengthparameter lists, Using the return operator, Private variables in subroutines	
UNIT -V	*PerlInputandOutput&Hashes*	**(06 Hours)**
	Introduction, Receiving input from standardinput,Working with inputfrom the diamond operator, Sending output to standard output, Using printf to format output,Workingwithfilehandles,Handlingfatalerrorswithdie, Introductionto hashes, Hashes defined and demonstrated, Accessing hash elements, Working with hash functions.	
UNIT -VI	*RegularExpressions*	**(06Hours)**

	Introduction to regular expressions, Regular expressions defined, Working with simple patterns, Working with character classes, Matching using m//,Working with match modifiers, Working with the binding operator, Working with match variables, Matching in list context, Performing substitutions using s///,Working with the split function, Working with the join function.	

Projectbasedlearning:

11. WriteabasicPerl program.
12. WriteaPerl programwith scalar data.
13. WriteaPerlprogram witharraysand lists.
14. WriteaPerl program with subroutines .
15. WriteaPerl program with input,output and hashes.
16. WriteaPerl programwithregular expressions.

ReferenceBooks:

12.DonColton“IntroductiontoProgrammingUsingPerl”SecondEdition

13.RandalL.Schwartz,briandfoy, TomPhoenix,“LearningPerl”,Sixthedition,Oreilly publication

14.EllieQuigley,“Perl byexample’,fifth edition

15.JosephN.HallandRandalL.Schwartz,“EffectivePerlProgramming:Writingbetterprogramswith Perl”,

16.CurisPoe,“BeginningPerl”1st Edition,Kindle Edition

17.MarkJasonDominus,“Higher-OrderPerl:TransformingProgramswithPrograms”,MorganKaufmann publication

18. William“Bro”Rothwell, “Perl:TheCompleteReference”,Secondedition,Indian edition

SyllabusforUnit Test:	
UnitTest -1	UNIT– I,UNIT– II,UNIT - III
UnitTest -2	UNIT– IV, UNIT–V, UNIT-VI

BharatiVidyapeeth(DeemedToBeUniversity),Pune Faculty of Engineering and Technology

Programme:B.Tech.(ElectricalEngg.andElectrical &ComputerEngg.)–CBCS2021Course

ElectiveCourse(SEMVIII)PythonProgramming		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Theory:03
Practical:02Hours/Week	ContinuousAssessment:40Marks	Practical:01
	TermWork:25MarksPractical:25Marks	Total:04

CoursePre-requisites:

1.studentsareexpectedtohaveagoodunderstandingofbasiccomputerprinciples.

2. Studentsshouldhavebasicknowledgeofbasicsofcomputerprogramminglanguages.

Courseobjectives:

1. Tolearnbasics,featuresandfutureofPython programming.
2. Toacquaintwithdatatypes,inputoutputstatements,decisionmaking,loopingandfunctionsinPython
3. TolearnfeaturesofObjectOrientedProgrammingusingPython
4. Toacquaintwiththeuseandbenefitsoffileshandlingin Python

CourseOutcomes:

Thestudentswillbeableto

1.	applyvariousskillsinproblemsolvingusingPythonProgramming
2.	Exhibittheprogrammingskillsfortheproblemsthoserequirethewritingofwelldocumentedprograms.
3.	Useofthelogicalconstructsoflanguage, Python.

Topicscovered

UNIT-I	**IntroductiontoPython:** Whatcanpythondo?,whypython?,procedureorientedandobjectorientedapproachofpython programming,pyhon Syntax compred to other programming languages, python IDE, Installation of Anaconda IDE(online Jyupter Colab), Using the Python interpreter, Features of Python, History and Future of Python, Writing and executing Python program	**(06Hours)**
UNIT-II	**BeginningPythonBasics** The Print statements and itsdifferent types, simple input output statement**,** Literal constants, variables and identifiers, Data Types, Comments, Reserved words, Indentation, Python Operatorsandexpressions,ExpressionsinPython,PythonDataStructuresandDataTypes- list,Tuples,Strings,Dictionary. List- creating, assessing, adding and updating values. Tuples-creating,assessing,addingandupdatingvalues. Strings-creating,assessing,addingandupdatingvalues. Dictionaries-creating,assessing,addingandupdatingvalues.	**(06Hours)**
UNIT-III	**DecisionControlStatements/ProgramFlows** Decision Control Statements: Decision control statements, Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements. Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, The break, continue, pass, else statement used with loops, Range statement and its forms.	**(06Hours)**
UNIT-IV	**FunctionsandModules** **Function**:definition,call,variablescopeandlifetime,thereturnstatement. Definingfunctions,Lambdaoranonymousfunction,documentationstring,good programming practices. **Introduction to modules:** Introduction to packages in Python, Introduction to standard library modules.	**(06Hours)**

UNIT-V	**FileHandlingandDictionaries** Files: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files, Appending Files, Handling File Exceptions, The with Statements.	**(06Hours)**
UNIT-VI	**ObjectOrientedProgrammingApproachUsingPython** ProgrammingParadigms-proceduralprogramminglanguage,structuredandobject oriented, **FeaturesofObjectorientedprogramming**-classes,objects,methodsandmessage passing, inheritance, polymorphism, containership, reusability, delegation, data abstraction and encapsulation. **ClassesandObjects**:classesandobjects,classmethodandselfobject,classvariables and object variables, public and private members, class methods.	**(06Hours)**

ListofPractical'stobeperformedinthelaboratory:	
1.	Tosimulatesimplecalculatorthatperformsbasictaskssuchasaddition,subtraction,multiplicationand division with special operations like computing xy and x!.
2.	Toacceptstudent'sfivecoursesmarksandcomputehis/herresult.Studentispassingifhe/shescoresmarks equaltoandabove40ineachcourse.Ifstudentscoresaggregategreaterthan75%,thenthegradeis distinction. If aggregate is 60>= and = and = and
3.	Togeneratepseudorandomnumbers
4.	ToacceptlistofNintegersandpartitionlistintotwosublistsevenandodd numbers
5.	Pythonprogramtoswaptwo variables
6.	PythonProgramtoCheckifaNumberisPositive,NegativeorZero
7.	PythonProgramtoPrintallPrimeNumbersinanIntervalandFindtheFactorialofaNumberusingfunctions
8.	PythonProgramtoDisplaythemultiplication Table
9.	PythonProgramtoFindtheSumofNaturalNumbers
10.	Tocounttotalcharactersinfile,totalwordsinfile,totallinesinfileandfrequencyofgivenwordin file.
11.	CreateclassEMPLOYEEforstoringdetails(Name,Designation,gender,DateofJoiningandSalary).Define functionmemberstocomputea)totalnumberofemployeesinanorganizationb)countofmaleandfemale employee c) Employee with salary more than 10,000 d) Employee with designation "Asst Manager"
12.	Writeapythonprogramthatacceptsastringfromuserandperformfollowingstringoperations-i.Calculate lengthofstringii.Stringreversaliii.Equalitycheckoftwostringsiii.Checkpalindromeii.Check substring
13.	PythonProgramtoAddTwoMatrices,MultiplyTwoMatrices,Transposea Matrix
14.	PythonListdataStructurePrograms PythonProgramtoappendelementinthelistPython Program to compare two lists Python Program to convert list to dictionaryPythonProgramtoremoveanelementfrom alistPython Program to add two lists Python Program to convert List to SetPythonProgramtoconvertlisttostring
15.	PythonDictionaryDataStructurePrograms Python Program to create a dictionaryPythonProgramtoconvertlisttodicti onaryPython Program to sort a dictionary PythonProgramtoMergetwo Dictionaries
Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	
Projectbasedlearning: Studentshalldemonstrateminimumoneconceptbasedoonsyllabustopic.	
Note: Thetermworkshallbetherecordofminimumeightexperimentsperformedfromtheabovelist.	

ReferenceBooks:	
1.	ReemaThareja,"PythonProgrammingUsingProblemSolvingApproach",OxfordUniversityPress,ISBN13: 978-0-19-948017-6
2.	R.NageswaraRao,"CorePythonProgramming",DreamtechPress;SecondeditionISBN10:938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL
3.	JeevaJose,P.SojanLal,"IntroductiontoComputing&ProblemSolvingwithPython",KhannaComputer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978- 9382609810.
4.	RomanoFabrizio,"LearningPython",PacktPublishingLimited,ISBN:9781783551712,1783551712
5.	R.G.Dromey,"HowtoSolveitbyComputer",PearsonEducationIndia;1stedition,ISBN10:8131705625, ISBN-13:978-8131705629MaureenSpankle,"ProblemSolvingandProgrammingConcepts",Pearson;9th edition,ISBN-10:9780132492645,ISBN-13:978-0132492645
6.	MartinC.Brown,"Python:TheCompleteReference",McGrawHillEducation,ISBN-10:9789387572942, ISBN-13:978-9387572942,ASIN:9387572943
UnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT-III
UnitTest-2	UNIT–IV,UNIT–V,UNIT-VI

ElectiveII:ANN		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITSALLOTED:**
Theory:03Hours/Week	EndSemesterExamination:60Marks	Credits:03
Practical:02Hours/Week	InternalAssessment:40Marks	Credit:01
	TW:25 Marks Oral:25Marks	Total: 04

CoursePre-requisites:

TheStudentsshouldhaveknowledgeof

1.	MachineLearning

CourseObjectives:

1.	Tointroducewithneuralnetworks
2.	TolearnSupervisedneuralnetworkalgorithms
3.	TointroduceRecurrentneuralnetworks

CourseOutcomes:

	Studentsareableto
1.	**Design**aneuralnetworksolutionforaclassification/regressionproblem
2.	**Apply**thebasicstomodelthe ANN
3.	**Write**Singlelayerperceptionclassifiers
4	**Implement**Multilayerperceptronusedtosolverealworldcomplexproblem
5.	**Handle**Feedback/RecurrentNeuralnetwork
6.	**Apply**theUnsupervisedneuralnetwork SOM

UNIT-I	**OverviewofBiologicalNeurons**	**(06Hours)**
	StructureofbiologicalneuronsrelevanttoANNs. BiologicalNeuronsandTheirArtificialModels,ModelsofArtificialNeuralNetworks, Neural Processing, Learning and Adaptation, Neural Network Learning Rules	
UNIT-II	**FundamentalConceptsofArtificialNeuralNetworks**	**(06Hours)**
	ModelsofANNs;Feedforward&feedbacknetworks;learningrules;Hebbianlearning rule,perceptionlearningrule,deltalearningrule,Widrow-Hofflearningrule,correction learningrule,Winner–lakeallelarningrule, etc.	
UNIT-III	**SinglelayerPerceptionClassifier**	**(06Hours)**
	Classification model, Features & Decision regions; training & classification using discreteperceptron,algorithm,singlelayercontinuous perceptronnetworksforlinearly seperable classifications.	
UNIT-IV	**Multi-layerFeedforwardNetworks**	**(06 Hours)**
	Linearlynon-seperablepatternclassification,Deltalearningruleformulti-perceptron layer,Generalizeddeltalearningrule,Errorback-propagation,learningfactors, Examples.	
UNIT-V	**Singlelayerfeedback Networks**	**(06Hours)**
	Basic Concepts of Dynamical Systems , Mathematical Foundations of Discrete-Time HopfieldNetworks,MathematicalFoundationsofGradient-Type+'HopfieldNetworks, Transient Response of Continuous-Time Networks, Relaxation Modeling in Single-LayerFeedbackNetworks,ExampleSolutionsofOptimizationProblems,Summing NetworkwithDigitalOutputs,MinimizationoftheTravelingSalesmanTourLength.	
UNIT-VI	**Selforganizingnetworks**	**(06Hours)**

	UNsupervisedlearningofclusters,winner-take-alllearning,recallmode,Initialisation of weights, seperability limitations. Counter propagation Network, Feature Mapping, Self-organizing Feature Maps, Cluster Discovery Network (ART1)	

RecommendedBooks:

1. IntroductiontoArtificialNeuralSystems,JacekZurada,WestPublishingCompany
2. NeuralNetworksandLearningMethods,SimonHykin,PearsonPublication
3. NeuralNetworks:ASystematicIntroduction,RaúlRojas,1996
4. PatternRecognitionandMachineLearning,ChristopherBishop,2007

MOOCCourses:1.NeuralNetworksandDeepLearning,Coursera,Andrew Ng
2.DeepLearningPart-I,SwayamProf.MiteshM.Khapra

E-books:http://www.deeplearningbook.org

SyllabusforUnitTest:	
UnitTest-1	UNIT–I,UNIT–II,UNIT–III
UnitTest-2	UNIT–IV,UNIT–V,UNIT–VI

TermWork: Thetermworkshallconsistofrecordofminimumeightexperiments.

1. DiscussApplicationsofneuralnetworksandsuitabletypeofnetworkusedineachapplication.
2. Whatdoyoumeanbysoftcomputingandtypesofsoftcomputingtechnique?
3. Explainfollowingconcepts:-
   (1) Deltalearningrule,
   (2) Widrow-Hofflearningrule,
   (3) Correctionlearningrule,
   (4) Winner–lakealllearningrule
4. BrieflyexplainHopfieldnetworks.
5. Create the Multi-layer Perceptron Neural Network / Back propagation network from scratch in Python using the weight and bias updation for solving the classification Problem. Also check the linear Seperability for AND and XOR problem using the created Multi-layer Perceptron Neural Network algorithm/ Back propagation network.
6. TrytoModifytheweightandbiasupdationformulabychangingorremovingthelearningrateusedintheMulti-layerPerceptronNeuralNetwork/Backpropagationnetworktochecktheimpactontheoverallperformanceof thenetwork
7. WritecodeinPythontoImplementObjectdetectionusingCNN.Alsodiscussaboutvariousperformance evaluation parameters to measure the performance of the object detection algorithms.
8. Buildaneuralnetworkarchitecturefromscratchin Pythonandperformthemulti-classclassificationtaskondata of your choice. Parameters to be considered while creating the neural network from scratch are specified as:
   (1) Noofhiddenlayers:1ormore
   (2) No.ofneuronsinhiddenlayer:100
   (3) Non-linearityinthelayer:Relu
   (4) Usemorethan1neuronintheoutputlayer.Useasuitablethresholdvalue
   (5) Optimisationalgorithm:StochasticGradientDescent(SGD)
   (6) Lossfunction:categoricalcrossentropyloss

Projectbasedlearning:

Form a group of 5-6 studentsand together select one of the topics for your project. Only one project should be submitted per group.

1. PatternrecognitionusingArtificialneuralnetworksinMATLAB
2. Perform Classification using artificial neural network to test the performance of image test dataset to increase performanceofnetwork andtoreducemeansquareerrorandnotedowntimetakentotrainthe networkbychangingnoof hidden neurons using nprtool tool used in MATLAB
3. Modifynprtooltoolbackendcodingtocreatedifferentnetworkandnotedowntheperformanceandresults.
4. PerformBackpropogationandperceptronnetworkinMATLAB.
5. PerformclusteringusingMatlabNeuralNetworktoolbox

https://sites.google.com/site/artificialneuralnetworksann/assignments

ElectricalCodes& Standards		
TEACHINGSCHEME:	**EXAMINATIONSCHEME:**	**CREDITS ALLOTTED:**
Theory:00	End Semester Examination: 00 Marks	Credits:00
Practical: 02	InternalAssessment:00Marks	Credit:01
	TW:25MarksOR:25 Marks	

CoursePre-requisites:	
TheStudents should havepriorknowledgeof	
	Standardvaluesneededforbetterworkingofelectricalpowersystems
Course Objectives:	
	UnderstandtheBasicsof ElectricalCodes&Standardsfor electricalpowersystems
Course Outcomes:	Afterlearningthis coursestudentswill beable to
1	UnderstandtheBasicsofElectricalCodes&Standards
2	Understandthe recommendedstandardsforTransformers,Earthing&hazardousareas
3	UnderstandtheElectricalCodes&Standards forLighting &Side flashes
4	UnderstandtheElectricalCodes&Standards forIllumination,Liftand escalators.
5	UnderstandtheElectricalCodes&StandardsforPowerdistribution,conductors,cables
6	UnderstandtheElectricalCodes&StandardsforElectricalInstallation&hardwarematerialusedin distribution networks

UNIT – I	**INTRODUCTIONtoElectricalCodes& Standards**	
	Basics of ElectricalCodes&Standards, Standardvalues, International system of units, electrical units & their equivalents, , Summary of Indian Electricity rules, degree of protection for electrical equipment, Insulating materials	
UNIT -II	**Transformers:**	
	Recommended sizes of cables on secondary side (for 11kv.0.433 transformers manufactured as per IS:2026-1977).Dieelctric strength of transformer oil as per IS:1866-1978**.** Testing of transformers as per BS 171. **Earthing:** Extractsof IS:3043-Electricalshocks&firehazards,IS:5216-Dos&Donts. **Hazardous areas:** ElectricalInstallationsinHazardousareas(abstractfromNationalElectriccode- 1985 and STEC 7 recommendations)	
UNIT-III	**Lighting&Sideflashes**	
	Protectionofbuildings&Alliedstructuresagainstlighting: Protectionofbuildings&Alliedstructuresagainstlighting(ExtractsfromIS:2309 and STEC 7recommendations). standard clearances of electrical lines as per BS:162-1961 and BS:159-1957 **Lighting:** Introduction,recommendedtypeoflightingprotectionsystem,recommended	

	materials for component parts for lightingprotection system , minimum dimensionsofcomponentpartsoflightingprotectivesystem,recommendationas per IS:2309-1989 and STEC for buildings. **Side flashes:** Introduction,RecommendationasperIS:2309-1989andSTEC	
UNIT-IV	**Illumination,Liftand escalators.**	
	Illumination: Introduction,Recommendedvaluesofilluminationfordifferentpartsofdomestic dwelling, glare index for commercial building,hospitals,hotels,assembly halls,cienemas,art galleries, sports buildings,industrial buildings, recommendation for mounting heights of luminaries. Illumination of roads & electrical installations (extracts from national electric code). **Liftand escalators:** Introduction,Bureauof standardsonliftsandescalators.	
UNIT -V	**Powerdistribution,conductors, cables,**	
	Powerdistribution: Tubularsteelpolesforoverheadpowerlines(extractsfrom IS;2713 -PartItoIII – 1980. **Conductors:** Technicalspecificationsasper IS:7098(1)-1988, IS:398(PartIV)1994. **Cables:** Heavyduty-insulatedpowercablesmanufacturedasperIS:692-1973,Household cables as per IS:694-1990, Household cables as per BS:2004-1961	
UNIT-VI	**ElectricalInstallation&hardwarematerialusedin distributionnetworks**	
	ElectricalInstallation: Designofelectricalpowerinstallationasper IEC364 standards. **Hardwarematerialusedin distribution networks:** Dimensions, normal weights etc for steel tubes(specidfications as per IS:1239(partI)-1979&speicificationsBS:1387-19670,Toleranceondiameterof black enameled MS conduit pipes as per IS:9537(PartII)1981	

TermWork:

Thetermwork shallconsist ofrecord ofminimumeight experimentsand notlimited tofollowing topics:

1. Reading,understandingandcheckingpracticallyElectricalCodes&Standardsfor**Transformers**at University campus/industrial organizations .
2. Reading,understandingandcheckingpracticallyElectrical Codes& Standardsfor**Earthinglocations** inUniversitycampus/industrial organizations.
3. Reading,understandingandcheckingpracticallyElectricalCodes&Standardsfor**Protectionof buildings & Allied structures against lighting** in University campus/industrial organizations.
4. Reading,understandingandcheckingpracticallyElectricalCodes&Standardsfor**Illumination facilities**in University campus/industrial organizations.
5. Reading, understanding and checking practically Electrical Codes & Standardsfor **Lifts** inUniversity campus/industrial organizations.
6. Reading,understandingandcheckingpracticallyElectricalCodes&Standardsfor**Powerdistribution, conductors, cables**in University campus/industrial organizations.
7. Reading,understandingandcheckingpracticallyElectricalCodes& Standardsfor**Electrical**

Installation&hardwarematerialusedindistributionnetworksinUniversitycampus/industrial organizations.

8.Reading,understandingandcheckingpracticallyElectricalCodes&Standardsfor**Hazardousareasif any**in University campus/industrial organizations.

TextBooks:

1. GortiRamamurthy,HandbookofElectricalPowerDistribution,Universitypress, Second edition

ReferenceBooks:

1. FredericPHartwell, NationalElectrical Code2020Handbook, Mcgraw hill,30th edition
2. AlonzoRobertJ,ElectricalCodes,Standards,RecommendedPracticesand Regulations, William Andrew Publishing, English- Hardcover
3. https://www.bis.gov.in/,BureauofIndianStandards(BIS)Catalogues,YearOfPublication: 2013 & 2023
4. NationalElectriccode2011&2016,GovernmentofIndia (https://law.resource.org/pub/in/bis/S05/is.sp.30.2011.pdf)
5. GuideFor UsingNationalBuildingCodeOfIndia2016,BureauOf IndianStandards(https://cpwd.gov.in/Publication/Booklet-Guide-for-Using-NBC-2016.pdf)
6. The Indian Electricity Rules,1956 (https://www.dgms.net/IErules1956.pdf)
7. NESCHandbook(sixthedition)-NationalElectricalSafetyCodeHandbook,IEEE, (https://ieeexplore.ieee.org/servlet/opac?punumber=4670086), 2007