BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Science
B.Sc. - Computer Science
New Syllabus

"Social Transformation Through Dinamic Education"

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE AND COMMERCE,

PUNE 411 038

Accredited with 'A+' Grade (2017) by NAAC
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC

BACHELOR OF COMPUTER SCIENCE (B.Sc.(CS)) PROGRAME

REVISED COURSE STRUCTURE (CBCS 2018 Course)

Under the Faculty of Science

TO BE IMPLEMENTED FROM ACADEMIC YEAR 2018-19

BHARATI VIDYAPEETH UNIVERSITY, PUNE (INDIA)

BACHELOR OF COMPUTER SCIENCE
(B.Sc. Computer Science)
(CBCS 2018 Course)
Under: Faculty of Science
(To be implemented from June 2018)

The B.Sc.(Computer Science) Degree Course is of three years duration divided into six semesters. The structure of the course and syllabus of the first year will come into effect from the academic year 2018-2019.The second and third year syllabus will be implemented from 2019-2020and 2020-2021 respectively.

1. Objectives: B.Sc. (Computer Science) Course:

1. To develop problem solving abilities using a computer
2. To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems
3. To imbibe quality software development practices
4. To create awareness about process and product standards
5. To train students in professional skills related to Software Industry
6. To prepare necessary knowledge base for research and development in Computer Science
7. To help students build-up a successful career in Computer Science

2. Rules & Regulations for B. Sc. (Computer Science) Course

Eligibility for Admission to B.Sc. (Computer Science) Course:

i. A candidate who has passed the Higher Secondary School Certificate Examination of the Maharashtra State Board or Higher Secondary Examination of its equivalent of any other statutory Board or University and has passed in English and in two Science subjects (i) Physics (ii) Mathematics shall be eligible for admission to the First year B.Sc (Computer Science) Degree course.

ii. Candidate who has passed H.S.C. examination (10+2) with English, Mathematics and any one of the following vocational subjects is also eligible for admission to the F.Y.B.Sc. (Computer Science) course.

Subject code	Subject
97	Information Technology
D9	Computer Science
C2	Electronics
J1/J2/J3	Electronics Technology

iii. Also student who has completed Diploma course in Engineering (Polytechnic) Computer Science, Electronics and Information Technology or its equivalent examination recognized by MBTE, Mumbai or its equivalent of any other statutory Board or University.

3. Admission process:

- Admissions will be given as per the selection procedure/policies adopted by the college, in accordance with conditions laid down by Bharati Vidyapeeth University, Pune.
- Reservation and relaxation will be as per the Government rules and Bharati Vidyapeeth University, Pune.

4. Intake Capacity:

Intake capacity of the students for this course at the entry level will be 80 per year.

5. Course Structure of B.Sc. (Computer Science) Degree Programme and scheme of credits

Course Structure and Scheme of Credits:

Course	Semester	Credits	Total of Semester	Grant Total of the year
F.Y.B.Sc. (Computer Science)	I	Theory (Core) - 18	30	62
		Practical – 06		
		Theory(Elective) – 06		
	II	Theory (Core) - 18	32	
		Practical – 06		
		Elective – 06		
		SEC-02		
S.Y.B.Sc. (Computer Science)	III	Theory (Core) -24	36	70
		Practical – 06		
		Theory(Elective) – 04		
		SEC-02		
	IV	Theory (Core) – 24	34	
		Practical-06		
		Theory(Elective) -04		
T.Y.B.Sc. (Computer Science)	V	Theory (Core) -20	34	66
		Practical-06		
		Theory(Elective) -04		
		AECC-02		
		Mini Project -02		
	VI	Theory (Core) -20	32	
		Practical-06		
		Theory(Elective) -04		
		Mini Project -02		
Grand Total of the Course (All Semesters)			**198 (192+6)**	**198**

6. Nature and Extent of B. Sc. (Computer Science):

Bachelor of Science (Computer Science) is a general multidiscipline bachelor programme. The programme has a balanced emphasis on three science subjects, one of which is computer science. A student studying B.Sc. (Computer Science) is required to choose two other subjects from a pool of subjects, which include Mathematics, Statistics, and Electronics. Different institutions offer different choice of combinations of subjects. Most popular combination is Mathematics and Electronics, but there are also combinations like Statistics and Economics or Commerce and Economics along with Computer Science.

6.1 Aims of Bachelor of Science Program in Computer Science B.Sc.(Computer Science):

The B.Sc. (Computer Science) program emphasizes problem solving in the context of algorithm development and software implementation and prepares students for effectively using modern computer systems in various applications. The curriculum provides required Computer Science courses such as Programming Languages, Data Structures, Computer Architecture and Organization, Algorithms, Database Systems, Operating Systems and Software Engineering; as well as elective courses in Data Mining, computer-based communication networks, distributed computing, Data

Analytics, web technology, and other current topics in computer science. The main aim of this Bachelor's degree is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. The purpose of the B.Sc. (Computer Science) are twofold:

1. to prepare the student for a position involving the design, development and implementation of computer software/hardware, and
2. to prepare the student for entry into a program of postgraduate study in Computer Science/Engineering and related fields

The B.Sc. (Computer Science) program focuses on the concepts and techniques used in the design and development of software systems. Students in this program explore the conceptual underpinnings of Computer Science, its fundamental algorithms, programming languages, operating systems and software engineering techniques. In addition, students choose from a rich set of electives that includes Data Analytics, , Cloud Computing, Data Mining and Data Warehousing and computer networks, among other topics. A generous allotment of free electives allows students to combine study in computer science with study in auxiliary fields to formulate a program that combines experiences across disciplines.

6.2 Graduate Attributes:

Graduate Attributes (GA) are the qualities, skills and understandings that students should develop during their time with the HEI. These are qualities that also prepare graduates as agents of social good in future.

Graduate Attributes can be viewed as qualities in following subcategories:

1. Knowledge of the discipline
2. Creativity
3. Intellectual Rigour
4. Problem Solving and Design
5. Ethical Practices
6. Lifelong Learning
7. Communication and Social Skills

Among these attributes, categories attributes under Knowledge of the Discipline are specific to a programme of study.

- **Knowledge of Discipline of Computer Science:**

Knowledge of a discipline is defined as command of a discipline to enable a smooth transition and contribution to professional and community settings. This Graduate Attribute describes the capability of demonstrating comprehensive and considered knowledge of a discipline. It enables students to evaluate and utilize information and apply their disciplinary knowledge and their professional skills in the workplace.

- **Creativity:**

Creativity is a skill that underpins most activities, although this may be less obvious in some disciplines. Students are required to apply imaginative and reflective thinking to their studies. Students are encouraged to look at the design or issue through differing and novel perspectives. Creativity allows the possibility of a powerful shift in outlook and enables students to be open to thinking about different concepts and ideas.

- **Intellectual Rigour:**

Intellectual Rigour is the commitment to excellence in all scholarly and intellectual activities, including critical judgement. The students are expected in having clarity in thinking. This capability involves engaging constructively and methodically when exploring ideas, theories and philosophies. It

also relates to the ability to analyse and construct knowledge with depth, insight and intellectual maturity.

- **Problem Solving and Design:**

Problem solving skills empower students not only within the context of their programmes, but also in their personal and professional lives. Many employers cite good problem solving skills as a desired attribute that they would like graduates to bring to the workplace. With an ability to seek out and identify problems, effective problem solvers are able to actively engage with a situation, think creatively, to consider different perspectives to address identified challenge, to try out possible solutions and subsequently evaluate results as a way to make decisions. Through this process they can consolidate new and emergent knowledge and develop a deeper understanding of their subject discipline.

- **Ethical Practices:**

Ethical practice is a key component of professionalism and needs to be instilled in curricula across courses. When operating ethically, graduates are aware that we live in a diverse society with many competing points of view. Ethical behaviour involves tolerance and responsibility. It includes being open-minded about cultural diversity, linguistic difference, and the complex nature of our world. It also means behaving appropriately towards colleagues and the community and being sensitive to local and global social justice issues.

- **Life-Long Learning:**

The skill of being a lifelong learner means a graduate is open, curious, willing to investigate, and consider new knowledge and ways of thinking. This flexibility of mind means they are always amenable to new ideas and actively seek out new ways of learning or understanding the world.

- **Communication and Social Skills:**

The ability to communicate clearly and to work well in a team setting is critical to sustained and successful employment. Good communication and social skills involve the ability to listen to, as well as clearly express, information back to others in a variety of ways - oral, written, and visual - using a range of technologies.

- **Self-Management:**

Graduates must have capabilities for self-organisation, self-review, personal development and life-long learning.

6.3 List of Graduate Attributes for B.Sc. (Computer Science):

Afore-mentioned GAs can be summarized in the following manner.

- A commitment to excellence in all scholarly and intellectual activities, including critical judgement
- Ability to think carefully, deeply and with rigour when faced with new knowledge and arguments.
- Ability to engage constructively and methodically when exploring ideas, theories and philosophies
- Ability to consider other points of view and make a thoughtful argument
- Ability to develop creative and effective responses to intellectual, professional and social challenges
- Ability to apply imaginative and reflective thinking to their studies
- Commitment to sustainability and high ethical standards in social and professional practices.

- To be open-minded about cultural diversity, linguistic difference, and the complex nature of our world
- Ability to be responsive to change, to be inquiring and reflective in practice, through information literacy and autonomous, self-managed learning.
- Ability to communicate and collaborate with individuals, and within teams, in professional and community settings
- Ability to communicates effectively, comprehending and writing effective reports and design documentation, summarizing information, making effective oral presentations and giving and receiving clear oral instructions
- Ability to demonstrates competence in the practical art of computing in by showing in design an understanding of the practical methods, and using modern design tools competently for complex real-life IT problems
- Ability to use a range of programming languages and tools to develop computer programs and systems that are effective solutions to problems.
- Ability to understand, design, and analyse precise specifications of algorithms, procedures, and interaction behaviour.
- Ability to apply mathematics, logic, and statistics to the design, development, and analysis of software systems
- Ability to be equipped with a range of fundamental principles of Computer Science that will provide the basis for future learning and enable them to adapt to the constant rapid development of the field.
- Ability of working in teams to build software systems.
- Ability to identify and to apply relevant problem-solving methodologies
- Ability to design components, systems and/or processes to meet required specifications
- Ability to synthesise alternative/innovative solutions, concepts and procedures
- Ability to apply decision making methodologies to evaluate solutions for efficiency, effectiveness and sustainability
- A capacity for self-reflection and a willingness to engage in self-appraisal
- Open to objective and constructive feedback from supervisors and peers
- Able to negotiate difficult social situations, defuse conflict and engage positively in purposeful debate.

6.4 Qualification Descriptor for B.Sc. (Computer Science):

On completion of B.Sc. (Computer Science), the expected learning outcomes that a student should be able to demonstrate are the following:

- Fundamental understanding of the principles of Computer Science and its connections with other disciplines
- Procedural knowledge that creates different types of professionals related to Computer Science, including research and development, teaching and industry, government and public service;
- Skills and tools in areas related to computer science and current developments in the academic field of study.
- Use knowledge, understanding and skills required for identifying problems and issues, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, and their application, analysis and evaluation using methodologies as appropriate to Computer Science for formulating solutions
- Communicate the results of studies undertaken in Computer Science accurately in a range of different contexts using the main concepts, constructs and techniques

- Meet one's own learning needs, drawing on a range of current research and development work and professional materials
- Apply Computer Science knowledge and transferable skills to new/unfamiliar contexts,
- Demonstrate subject-related and transferable skills that are relevant to industry and employment opportunities.

6.5 Programme Learning Outcomes for B.Sc. (Computer Science):

The Bachelor of Science (Computer Science) program enables students to attain, by the time of graduation:

- demonstrate the aptitude of Computer Programming and Computer based problem-solving skills
- display the knowledge of appropriate theory, practices and tools for the specification, design, implementation
- ability to learn and acquire knowledge through online courses available at different MOOC Providers
- ability to link knowledge of Computer Science with other two chosen auxiliary disciplines of study
- display ethical code of conduct in usage of Internet and Cyber systems
- ability to pursue higher studies of specialization and to take up technical employment
- ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate
- ability to operate, manage, deploy, configure computer network, hardware, software operation of an organization
- ability to present result using different presentation tools.
- Ability to appreciate emerging technologies and tools

F.Y.B.Sc. (Computer Science): Semester I (From the Academic Year 2018-19)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -11	Introduction to RDBMS	03	03	03	40	60	100
	CS -12	Programming in C - I	03	03	03	40	60	100
	CS -13	Mathematical Foundation of Computer Science	03	03	03	40	60	100
	CS -14	Algebra -I	03	03	03	40	60	100
	CS -15	Principles of Analog Electronics - I	03	03	03	40	60	100
	CS-16	Principles of Digital Electronics -I	03	03	03	40	60	100
	CS PI	Computer Science Practical - I	04	02	03	40	60	100
	CS PII	Computer Science Practical - II	04	02	03	40	60	100
	CS EI	Electronics Practical -I	04	02	03	40	60	100
Elective Courses	**Any Two from the following:**							
	CS -17	Computer Oriented Statistical Techniques - I	03	03	03	40	60	100
	CS-18	Compulsory English -I	03	03	03	40	60	100
	CS-19	Elementary Algorithmics	03	03	03	40	60	100

F.Y.B.Sc. (Computer Science): Semester II (From the Academic Year 2018-19)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -21	RDBMS using oracle	03	03	03	40	60	100
	CS -22	Programming in C - II.	03	03	03	40	60	100
	CS -23	Graph Theory	03	03	03	40	60	100
	CS -24	Algebra-II	03	03	03	40	60	100
	CS -25	Principles of Analog Electronics - II	03	03	03	40	60	100
	CS -26	Principles of Digital Electronics -II	03	03	03	40	60	100
	CS PIII	Computer Science Practical - III	04	02	03	40	60	100
	CS PIV	Computer Science Practical - IV	04	02	03	40	60	100
	CS EII	Electronics Practical –II	04	02	03	40	60	100

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Elective Courses	**Any Two from the following:**							
	CS -27	Computer Oriented Statistical Techniques -II	03	03	03	40	60	100
	CS-28	Compulsory English -II	03	03	03	40	60	100
	CS-29	Operating Environment	03	03	03	40	60	100
		This paper is compulsory for all the students:						
Skill Enhancement course	UGSEC-21	HTML Programming	02	02	03	20	30	50

S.Y.B.Sc. (Computer Science): Semester III (From the Academic Year 2019-20)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -31	Object Oriented Programming with C++	04	04	03	40	60	100
	CS -32	Introduction to .Net using C#	04	04	03	40	60	100
	CS -33	Linear Algebra	04	04	03	40	60	100
	CS -34	Computer Oriented Numerical Methods	04	04	03	40	60	100
	CS -35	Digital systems and Microprocessors	04	04	03	40	60	100
	CS -36	Principles of Communication	04	04	03	40	60	100
	CS PV	Computer Science Practical - V	04	02	03	40	60	100
	CS PVI	Computer Science Practical - VI	04	02	03	40	60	100
	CS EIII	Electronics Practical - III	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -37	Cloud Computing - I	04	04	03	40	60	100
	CS -38	Data warehousing and data mining-I	04	04	03	40	60	100
Skill Enhancement Course	**This paper is compulsory for all the students:**							
	UGSEC-31	Programming in Python	02	02	02	20	30	50

S.Y.B.Sc. (Computer Science): Semester IV (From the Academic Year 2019-20)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -41	Data Structures using C++	04	04	03	40	60	100
	CS -42	ASP.Net	04	04	03	40	60	100
	CS -43	Computational Geometry	04	04	03	40	60	100
	CS -44	Optimization Techniques	04	04	03	40	60	100
	CS -45	8051 Microcontroller	04	04	03	40	60	100
	CS -46	Analog Systems	04	04	03	40	60	100
	CS PVII	Computer Science Practical - VII	04	02	03	40	60	100
	CS PVIII	Computer Science Practical - VIII	04	02	03	40	60	100
	CS EIV	Electronics Practical -IV	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -47	Cloud Computing -II	04	04	03	40	60	100
	CS -48	Data warehousing and data mining-II	04	04	03	40	60	100

Environment Studies

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 50 lectures for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree marksheet. If any student fails in this course, the result of his/her degree course will be withheld by the university.

T.Y.B.Sc(Computer Science): Semester V (From the Academic Year 2020-21)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -51	System Programming	04	04	03	40	60	100
	CS -52	Internet Technologies-I	04	04	03	40	60	100
	CS -53	Theoretical Computer Science	04	04	03	40	60	100
	CS -54	Programming in JAVA-I	04	04	03	40	60	100
	CS -55	Software Engineering	04	04	03	40	60	100
	CS PIX	Computer Science Practical - IX	04	02	03	40	60	100

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
	CS PX	Computer Science Practical -X	04	02	03	40	60	100
	CS PXI	Computer Science Practical -XI	04	02	03	40	60	100
	CS MI	Mini Project –I	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -56	Data Communication and Networking -I	04	04	03	40	60	100
	CS -57	Data Analytics -I	04	04	03	40	60	100
	CS -58	Research in Computer Science –I	04	04	03	40	60	100
Ability enhancement Compulsory Course	**This paper is compulsory for all the students:**							
	UGAE CC-51	Soft Skills	02	02	02	20	30	50

T.Y.B.Sc. (Computer Science): Semester VI (From the Academic Year 2020-21)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -61	Linux Programming	04	04	03	40	60	100
	CS -62	Internet Technologies-II	04	04	03	40	60	100
	CS -63	Compiler Construction	04	04	03	40	60	100
	CS -64	Programming in JAVA-II	04	04	03	40	60	100
	CS -65	Unified Modeling Language	04	04	03	40	60	100
	CS PXII	Computer Science Practical - XII	04	02	03	40	60	100
	CS PXIII	Computer Science Practical -XIII	04	02	03	40	60	100
	CS PXIV	Computer Science Practical -XIV	04	02	03	40	60	100
	CS MII	Mini Project -II	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -66	Data Communication and Networking-II	04	04	03	40	60	100
	CS -67	Data Analytics -II	04	04	03	40	60	100
	CS -68	Research in Computer Science –II	04	04	03	40	60	100

7. SCHEME OF TEACHING:

Semester	Subject	Work Load / Week			
		Theory	Tutorial	Total	Practical
F.Y.B.Sc(Computer Science) Semester – I & II	Each subject	2	1	03	04
S.Y.B.Sc(Computer Science) Semester – III & IV	Each subject	3	1	04	04
T.Y.B.Sc(Computer Science) Semester – V & VI	Each subject	3	1	04	04

8. MEDIUM OF INSTRUCTION:

The medium of instruction and examination shall be English.

9. CHANGE OF COURSE

As all the heads of the course are compulsory change of course is not allowed**.**

10. SCHEME OF EXAMINATION: The Assessment of Regular students of Bachelor of Science (B.Sc.) course in the academic session 2018-19 and thereafter shall be based on

a. University Examinations (UE),
b. Internal Assessment (IA),
c. Choice Based Credit System (CBCS), and
d. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average system (CGPA)

For each core and elective paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks. The Internal Assessment may be in the forms as follows:

a) Attendance 10 Marks
b) Home Assignment/Tutorial/Test/Presentation 15 Marks
c) Mid Semester Examination 15 Marks

Each practical examination for laboratory course is of 100 marks and three-hour duration. The mini project included in the in Semesters V and VI will be evaluated for 100 marks for the allotted credits by a panel consisting of one internal and one external examiner .For both laboratory course and mini project , there will be internal assessment of 40 marks and the university examination of 60 marks.

A candidate shall be permitted to proceed further from the first semester upto Fourth Semester Irrespective of his/her failure in any of the semester Examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (Subsequent) semester subject. However he/she should have cleared all the papers at F.Y.B.Sc. (Comp. Sc.) I and II when He/She gets admission to T.Y.B.Sc. (Comp. Sc.) Sem V.

11. GRACING:

The gracing shall be done as per existing rules of the University.

12. VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

13. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq$ Marks ≤ 100	O	10
$70 \leq$ Marks < 80	A+	9
$60 \leq$ Marks < 70	A	8
$55 \leq$ Marks < 60	B+	7
$50 \leq$ Marks < 55	B	6
$40 \leq$ Marks < 50	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA

Formula to calculate Grade Points (GP)
Suppose that '*Max*' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set $x = Max / 10$ (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq$ Marks $\leq 10x$	10
$5.5x \leq$ Marks $< 8x$	Truncate (Marks/x) +2
$4x \leq$ Marks $< 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula $SGPA=\frac{\sum Ck \times GPk}{\sum Ck}$, where C_k is the credit-value assigned to a course and $GP_k$is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the formula $CGPA=\frac{\sum Ck \times GPk}{\sum Ck}$,where C_k is the credit-value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA) =	10 × CGPA – 10	if 5.00 ≤ CGPA ≤ 6.00
	5 × CGPA+ 20	if 6.00 ≤ CGPA ≤ 8.00
	10 × CGPA – 20	if 8.00 ≤ CGPA ≤ 9.00
	20 × CGPA – 110	if 9.00 ≤ CGPA ≤ 9.50
	40 × CGPA – 300	if 9.50 ≤ CGPA ≤ 10.00

Award of Honours:
A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	**Final Grade**	**Performance Descriptor**	**Equivalent Range of Marks (%)**
9.50 ≤CGPA≤ 10.00	O	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤CGPA≤ 9.49	A+	Excellent	70 ≤ Marks < 80
8.00 ≤CGPA≤ 8.99	A	Very Good	60 ≤ Marks < 70
7.00 ≤CGPA≤ 7.99	B+	Good	55 ≤ Marks < 60
6.00 ≤CGPA≤ 6.99	B	Average	50 ≤ Marks < 55
5.00 ≤CGPA≤ 5.99	C	Satisfactory	40 ≤ Marks < 50
CGPA Below 5.00	F	Fail	Marks Below 40

14. Format of the transcript:
The student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details:

Course No.	Course Name	No. of Credits	University Examination		Internal Assessment		Grade Point Average	Result
			Grade	Grade Point	Grade	Grade Point		
1								
2								
3								
4								
5								
Total Cumulative Credits Completed			SGPA		CGPA		Equivalent Marks (%)	
Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be the GPA.								

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F.Y.B.Sc. (Computer Science)(CBCS 2018 Course) Semester –I

CS- 11 : Introduction to RDBMS

Course outcomes:

At the end of this course, a student shall be able to:

- solve real world problems using appropriate set, function, and relational models
- design E-R Model for given requirements and convert the same into database tables
- use database techniques such as SQL
- enhance the knowledge of database, file and types of file organizations

Total credits: 03 **Total lectures: 45**

Course content

1. File Organization (10)

1.1 Introduction
1.2 Physical / logical files
1.3 Types of file organization
1.4 Choosing a file organization

2. Introduction to RDBMS (05)

2.1Structure of Relational Databases (table, row, relation, Tuple)
2.2 keys in a relational database

3. Database Architecture (08)

3.1 Data models (relational, hierarchical, network)
3.2 Data abstraction
3.3 Data independence
3.4 Classification of DBMS

4. Conceptual Design (E-R model) (10)

4.1 Overview of DB design
4.2 ER data model (entities, attributes, entity sets, relations, relationship sets)
4.3 constraints (Key constraints, Mapping constraints, Strong & Weak entities, aggregation / generalization)
4.4 Conceptual design using ER modeling (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)
4.5 Case studies

5. Structure Query Language (12)

5.1 Introduction DDL (create, drop, alter), DML Statements (Insert, Update, Delete)
5.2 Forms of Basic SQL Query
5.3 union, intersection, nested queries
5.4 Aggregate Operator (group by, having), Aggregate functions

References

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan,
2. Database Management Systems ,Raghu Ramakrishnan, Mcgraw-hill higher Education
3. Database Management Systems,Raghu Ramakrishnan and Johannes
4. Gehrke ,McGraw-Hill Science/Engineering/Math; 3 edition,
5. Database Systems, Shamkant B. Navathe, Ramez Elmasri

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –I

CS-12 : Programming in C - I

Course Outcomes:

At the end of this course, a student shall be able to:

- design the algorithms and draw flowcharts for solving mathematical and engineering problems.
- demonstrate an understanding of computer programming language concepts.
- develop C programs using data types, operators and various loops.
- design and develop Computer programs, analyze, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

Total credits: 03 **Total lectures: 45**

Course content

1. Introduction (5)

Introduction to problem solving, Program development process, algorithms, Flowchart , Introduction to programming languages (High level, low level , machine)compiler, interpreter, assembler, linker, loader.

2. Introduction to C language (10)

Structured programming concept, benefits of structured programming, History of C language, Importance of C, Basic Structure of C program, scope, features, objectives and application areas, writing and executing a C program, benefits of structure programming.

3. C fundamentals (08)

Character set, C tokens, keywords, identifiers, variables, constants, operators(arithmetic, relational, logical ,special and other), expressions, data types, statements, Managing I/O operations.

4. Control structures (12)

Introduction, Basic control structures (sequence, selection/decision making Statement, Iterative statements, jump statements. etc.)

5. Functions (10)

Introduction, Standard functions, need for user defined functions , advantages of functions, how to write function, calling a function, Passing parameters, methods of passing arguments, recursion, storage Classes and its scope rules**.**

References

- Programming in C by S . Kohan
- Born to code in C by H. Schildt
- The art of C by H. Schildt
- C programming by Kerninghan & Richie by 2 nd edition
- Let us C by Yashwant Kanetkar
- C programming by E. Balaguruswami

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester -I

CS-13: Mathematical Foundation of Computer Science

Course Outcomes

At the end of this course, a student shall be able to:

- understand tautology, predicates and quantifiers.
- draw Hasse diagrams, example of lattices and it's types.
- apply counting principles, applications of Pigeonhole principle, permutation and combination to determine probability.
- solve recurrence relation for finding total solution with the help of homogenous solution and particular solution.

Total credits: 03 **Total lectures: 45**

Course content

Unit 1: Logic (12)

1.1 Revision: Propositional Logic, Propositional Equivalences.

1.2 Predicates and Quantifiers: Predicate, *n*-Place Predicate or, n-ary Predicate, Quantification and Quantifiers, Universal Quantifier, Existential Quantifier, Quantifiers with restricted domains, Logical Equivalences involving Quantifiers.

1.3 Rules of Inference: Argument in propositional Logic, Validity Argument (Direct and Indirect methods), Rules of Inference for Propositional Logic, Building Arguments.

Unit 2: Lattices and Boolean Algebra (12)

2.1 Poset, Hasse diagram.

2.2 Lattice, Complemented lattice, Bounded lattice and Distributive lattice.

2.3 Boolean Functions: Introduction, Boolean variable, Boolean Function of degree n, Boolean identities, Definition of Boolean Algebra.

2.4 Representation of Boolean Functions : Minterm, Maxterm Disjunctive normal form, Conjunctive normal Form.

Unit 3: Counting Principles (11)

3.1 Cardinality of a Set: finite set, countable and uncountable sets.

3.2 Basics of Counting: The Product Rule, The Sum Rule, The Inclusion-Exclusion Principle.

3.3 The Pigeonhole Principle: Statement, The Generalized Pigeonhole Principle, Its Applications.

3.4 Generalized Permutations and Combinations: Permutation and Combination with Repetitions, Permutations with Indistinguishable Objects, Distributing objects into boxes: Distinguishable objects and distinguishable boxes, Indistinguishable objects and distinguishable boxes, Distinguishable objects and Indistinguishable boxes, Indistinguishable objects and Indistinguishable boxes

Unit 4: Recurrence Relations (10)

4.1 Recurrence Relations : Introduction, Formation.

4.2 Linear Recurrence Relations with constant coefficients.

4.3 Homogeneous Solutions. **4.4** Particular Solutions. **4.5** Total Solutions.

Reference Books:

1. Kenneth Rosen, Discrete Mathematics and It's Applications (Tata McGraw Hill)
2. C. L. Liu ,Elements of Discrete Mathematics, (Tata McGraw Hill)
3. S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakashan, 1998

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F.Y.B.Sc. (Computer Science)(CBCS 2018 Course) Semester-I

CS-14 : Algebra-I

Course Outcomes:

At the end of this course, a Student shall be able to:

- understand the concepts of sets, relations, functions, equivalence class and types of functions.
- find transitive closure with the help of Warshall's algorithm.
- understand integers, g.c.d., l.c.m. Concept of Division algorithm and obtain g.c.d by Division algorithm.
- understand coding, decoding, error detection and correction.
- understand the concepts of complex numbers, modulus and argument of complex numbers and solution of equations by using DeMoivre's theorem.

Total credits: 03 **Total lectures: 45**

Course content

Unit 1: Relations and functions (12)

(1.1) Ordered pairs, Cartesian product of Sets.

(1.2) Relations, types of relations, equivalence relations. Partial orderings.

(1.3) Equivalence Class, properties and partition of a set.

(1.4) Transitive closure and Warshall's Algorithm.

(1.5) Digraphs of relations, matrix representation and composition of relations.

(1.6) Definition of function as relation, types of functions (one-one, onto and bijective)

Unit 2: Divisibility in Integers (15)

(3.1) Well ordering principle

(3.2) First and second Principle of Mathematical Induction, Examples

(3.3) Division Algorithm (without proof)

(3.4) Divisibility and its properties, prime numbers.

(3.5) Definition G.C.D and L.C.M., Expressing G.C.D. of two integers as a linear combination of the two integers. **(3.6)** Euclidean Algorithm (Without proof).

(3.7) Relatively prime integers, Euclid are Lemma and its generalization.

(3.8) Congruence relations and its properties, Residue Classes: Definition, Examples: Z_n , +, X), Z_n is a field iff n is prime, addition and multiplication modulo n and composition tables

(3.9) Euler's and Fermat's Theorems. (Without proof).Examples

Unit 3: Coding Theory, Automata Theory and Languages, Group Codes (08)

(3.1) Coding of binary information and error detection

(3.2) Decoding and error correction **(3.3)** Linear codes, parity check

(3.4) Generator matrix ,examples of coset leader

Unit 4: Complex Numbers (10)

(4.1) Revision: Addition, Subtraction, Multiplication, Conjugate, Division

(4.2) Modulus and Argument of Complex number, Geometric Representation

(4.3) Polar form and it's properties **(4.4)** DeMoivre's theorem and it's applications

(4.5) Solution of equations by using DeMoivre's theorem

Text Books:

1. S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakashan, 1998
2. M.D.Bhopatkar, C.S.Nimkar, S.Joglekar; Algebra; Vision Publications,1998.
3. S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare; Algebra; Nirali Prakashan, 1998.

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester I

CS-15 : Principles of Analog Electronics – I

Course Outcomes:

At the end of this course, a student shall be able to:

- study circuits in a systematic manner suitable for analysis and design.
- analyze the electric circuit using network theorems.
- reproduce the I-V characteristics of BJT and its biasing , JFET and MOSFET devices
- apply standard device models to explain/calculate critical internal parameters of semiconductor devices
- explain the behavior and characteristics of power devices such as SCR and UJT etc.

Total credits: 03 **Total lectures: 45**

Course content

1. Introduction to components (06)

Resistors, Capacitors, Inductors and Transformers, Charging and discharging of capacitors, Growth and decay of current in L-R circuits, Growth and decay of voltage in C-R circuits, Simple numerical on the above

2. Network theorems (only statement and problems applied to DC) (10)

Revision of Ohm's law & Kirchoff's laws, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Superposition theorem, (numerical problems with maximum two meshes)

3. Bipolar Junction Transistor (15)

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V Characteristics, parameters, specifications; BJT as an amplifier .Transitor amplifier configuarations - CB, CC and CE; Transistor biasing, Q-point; DC load line for a CE amplifier; Transistor as a switch; Simple numerical problems on biasing and DC load line.

4. Amplifier (04)

Concept and definition of an amplifier, Classification based on frequency, coupling and operating point, Single stage RC coupled CE amplifier, Frequency response and bandwidth of RC coupled amplifier .

5. JFET and MOSFET (10)

Working Principle of JFET and MOSFET, I/V Characteristics, Parameters, Application of JFET as a switch and as an amplifier, Numerical problems, comparison of JFET, MOSFET and BJT, Working principle of UJT and SCR, Application of UJT as relaxation Oscillator.

Reference Books

1. Integrated circuits by Milliman.
2. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
3. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition, 2010
4. Electronic Principles:Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
5. Principals of Electronics: V.K. Mehta, S.Chand and Co.
6. A text book of electrical technology: B.L.Theraja, S.Chand and Co.

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester I

CS- 16: Principles of Digital Electronics –I

Course Outcomes:

At the end of this course, a Student shall be able to:

- understand and represent numbers in powers of base and converting one from the other, carry out arithmetic operations
- understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions
- understand and implement Boolean algebra and K-maps
- analyze and design combinatorial as well as sequential circuits

Total credits:03 **Total lectures: 45**

Course Content

1. Number Systems And conversions (06)

Binary, Octal , Decimal, Hexadecimal number systems; Inter conversions of number systems; BCD, Excess-3 code, Gray codes and Hamming codes; Error detection and correcting codes; Excess three code , One's and Two's compliment method; Examples

2. Logic gates And their Applications (15)

Revision of different logic gates; Boolean algebra and a few identities; De-Morgan's I^{st} and 2^{nd} theorem; Interconversion of gates; Rules of binary addition and subtraction, subtraction using 1's and 2's complements; Half adder, full adder, Half subtractor, Full subtractor, Four bit parallel adder; Universal adder / subtractor, Digital comparator; Introduction to logic families; TTL NAND gate, input output parameters, tristate logic; Fan-in fan-out, propagation delay, noise margin

3. Boolean Algebra and Karnaugh maps (12)

Boolean algebra rules and Boolean laws: Commutative, Associative, Distributive; AND, OR and Inversion laws; De Morgan's theorem, Universal gates; Min terms, Max terms, Boolean expression in SOP and POS form; conversion of SOP/POS expression to its standard SOP/POS form., Simplifications of Logic equations using Boolean algebra rules; Introduction to Karnaugh's map; Formation of Pair,Quad and Octet; Significance of Karnaugh Map; Simplification of 2,3 and 4 variables using K-Map

4. Multiplexers - Demultiplexers and Encoder –Decoder (12)

Introduction to multiplexers and Demultiplexers; 2:1,Mux 4:1Mux, 8:1 Mux; Multiplexer Tree; 1:2Demux,1:4Demux,1:8Demux; Introduction to Encoders and decoders; Decimal to BCD encoder; BCD to 7 Segment Decoder; Study of IC 74147 and IC74138.

Reference Books:

1. Digital Electronics: Jain R.P., Tata McGraw Hill
2. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
3. Digital Fundamentals: Floyd T.M., Jain R.P, Pearson Education

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F.Y.B.Sc.(Computer Science) (CBCS 2018 Course) Semester I

CS PI : Computer Science Practical -I

Total credits: 2

Course outcomes:

At the end of this course, a student shall be able to:

- enhance the fundamental concepts of RDBMS
- explore the knowledge about SQL environment
- work with operations of SQL

Course content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Semester examination: 60 Marks in One session of 3 Hrs .

60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Create simple tables.
2. Create tables using various data constraints.
3. Create tables using existing tables.
4. Different forms of select statements
5. Queries using insert, delete statements.
6. Queries using Alter and Update statements.
7. Simple queries using functions & Set Operators.
8. Simple queries using mathematical functions and Date functions

NOTE: At least 8 assignments must be performed.

Note: An Industrial visit should be arranged and report should be submitted at the end of academic year.

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F.Y.B.Sc. (Computer Science) (2018 Course) Semester I

CS PII : Computer Science Practical -II

Total credits: 2

Course Outcomes

After completion of this course, a student shall be able to:

- Understand the fundamental concepts of C language
- learn and implement control structures and functions
- design and implement simple C programs using loops and functions

Course content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Introduction to c programming environment.
2. Basic programs using c programming language including use of arthmatic operators, areas etc.
3. Program base on if statements,if---else and nested if else statements
4. Programs based on condition checking and Looping (e.g. inverting Number, checking whether number is prime, finding GCD and LCM etc.)
5. .Program based on switch case ,return and goto statements.
6. Program using Function
7. Program using recursion

NOTE : At least 8 assignments must be performed.

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester -I

CS EI : Electronics Practical –I

Total credits: 2

Course Outcomes

At the end of this course, a student shall be able to:

- use basic concepts for building various applications in Electronics.
- understand design procedures of different electronic circuits as per requirement.
- build experimental setup and test the circuits.
- analyze test results of given experiments.

Course content

- One activity equivalent to 2 experiments by the student.
  a. Electronics project
  b. Documentation type experiments
  c. Presentation/Seminar on Electronics /advanced topic/research topics.
- One activity equivalent to 2 experiments to be arranged by the teacher – Arrange at least two practical demonstrations / Workshops /Industrial visit which will enhance quality and skills of the student.
- Examination will be conducted on 8 experiments as well as on activities

Practical Examination

A) Internal Marks 40: Completion of journal, attendance and involvement in activities.

B) Semester examination: 60 Marks in One session of 3 Hrs. 60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

List of Topics

1. Identification of circuit components.
2. Use of CRO signal generators , power supplies and multimeters.
3. CRO for frequency ,phase and amplitude measurements.
4. Verification of KCL,KVL.
5. Verification of Thevenin's theorem.
6. Verification of Nortan's theorem.
7. Verification of maximum power transfer theorem.
8. Transistor as a switch.
9. FET characteristics.
10. SCR characteristics.
11. Study of logic gates.
12. Verification of De-Morgan's theorem and conversion of one gate to other
13. Study of potential divider biasing of BJT and its use in DC motor driving
14. Diode as half wave, full wave and bridge rectifier.
15. Study of output and transfer characteristics JFET/MOSFET
16. Study of I-V characteristics of UJT and Demonstration of UJT based relaxation oscillator.

NOTE : At least 8 Practical's must be performed.

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester- I

CS - 17 : Computer Oriented Statistical Techniques –I

Course Outcomes

At the end of this course, a student shall be able to:

- understand the importance and scope of statistics in various fields such as medical, management, economics, social science etc. & statistical organisation in India.
- know different types of data and its classification and graphs.
- know organisation and evaluation of different types of data and evaluation of summary
  measure such as measures of central tendency, dispersion, skewness and kurtosis.
- understand bi-variable data, their organisation, evaluation and scatter diagram and their interpretations.
- understand correlation, regression, regression lines and their utility.

Total credits: 3 **Total lectures: 45**

Course content

Unit 1. Scope of Statistics and Data Condensation and Graphical Methods (12)

1.1 Defination : Webseter's and Secrist's definition of Statistics
1.2 Importance of statistics
1.3 Scope of statistics : Industry, Goverment,. Computer science, social science,etc
1.4 Raw data, attributes and variables, discrete and continuous variables
1.5 General principles of classification of raw data
1.6 Construction of frequency distributionand cumulative frequency distribution, relative frequency distribution.
1.7 Graphical representation of frequency distribution : histogram,frequency polygon,frequency curve , ogive curve
1.8 Diagrammatic representation : simple bar, subdivided bar, pie diagram, use of MS-excel/ spreadsheet for domonstrating these diagram
1.9 Numerical problems

Unit 2.Measures of Central Tendency and Dispersion (12)

2.1 Concept of central tendency
2.2 Criteria for good measures of central tendency
2.3 Arithmetic mean : definition for ungrouped and grouped data, combined mean, merits and demerits
2.4 Median: defination, formula for computation for ungrouped and grouped data, graphical methods, merits and demerits
2.5 Mode: definition, formual for computation for ungrouped and grouped data, merits and demerits
2.6 Use of appropriat average
2.7 Quartiles: defination, formulae for grouped data
2.8 Concept of dispersion and measures of dispersion
2.9 Absolute and relative measure of dispersion
2.10 Range: definition for ungrouped data, merits and demerits
2.11 Variance: definition for ungrouped and grouped data, combined Variance for two groups, merits and demerits
2.12 Standard deviation: definition for ungrouped and grouped data, Coefficient of variation
2.13 Numerical problems

Unit 3. Moments and Measures of Skewness and Kurtosis (11)

3.1 Raw and central moments: definition, for ungrouped and grouped Data (only up to first 4 moments)

3.2 Relation between central and raw moments

3.3 Idea of symmetric frequency distribution, skewness of a frequency distribution, positive and negative skewness, empirical relation between mean, median and mode

3.4 Pearson's and Bowley's coefficients of skewness

3.5 Idea of kurtosis for a frequency distribution

3.6 Measures of skewness and kurtosis based on moments

3.7 Numerical problems

Unit 3. Correlation and Regression (for ungrouped data) (10)

4.1 Bivariate data : scatter diagram

4.2 Concept of correlation, positive correlation, negative correlation

4.3 Karl Pearson's cofficient of correlation (r)

4.4 Limits of r, $-1 \leq r \leq 1$, and interpretation of r

4.5 Concept of regression, cause and effect relation

4.6 Properties of regression coefficient : $b_{xy}\ b_{yx} = r^2$, $b_{xy}\ b_{yx} \leq 1$, $bxy = r\sigma_x/\sigma_y$, and $bxy = r\ \sigma_y/\sigma_x$

4.7 Numerical problems

Books Recommended

1. Hogg R. V. and Craig, R. G. Introduction to Mathematical Statistics.
2. Hoel. P. G. Introduction to Mathematical Statistics.
3. Feller. W Introduction to probability Theory and it's Applications. Vol –I
4. Mood A. M., Grabill, F. A. Boes D. C. Introduction to Theory of Statistics.
5. Meyar P. L. Introduction to Probability and Statistical Applications.
6. Goon, Gupta and Das Gupta Fundamentals of Statistics Vol I & II
7. S. P. Gupta Statisticalmethods.

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F. Y. B. Sc.(Computer Science) (CBCS 2018 Course) Semester – I

CS 18: Compulsory English – I

Course Outcomes:

At the end of this course, a student shall be able to:

- get exposed to the prose passages, poems and communicative grammar skills
- read and interpret the various types of texts on their own and discuss them among peers
- communicate effectively by developing their proficiency in language
- understand their language abilities and facilitate them to with the necessary online & offline resources

Total Credits: 03 **Total Lectures: 45**

Course Content:

Prescribed Text: ***Views & Visions: An English Course book for Undergraduates*** *by* Orient BS

Prose:

1. Towards Universal Brotherhood — *Rashtrasant Tukdoji Maharaj*
2. Buddha, 'The Enlightened One' — *Max Eastman*
3. How Wealth Accumulates and Men Decay — *George Bernard Shaw*
4. The Romance of a Busy Broker — *O. Henry*
5. Kalpana Chawla — Anonymous

Poetry:

1. Where the Mind is Without Fear — *Rabindranath Tagor*
2. A Psalm of Life — *H.W. Longfellow*
3. Mirror — *Sylvia Plath*
4. Lord Ullin's Daughter — *Thomas Cambell*
5. Curious Mishaps — *Vikram Seth*

Grammar, Usage and Composition:

1. Articles
2. Prepositions
3. Tense
2. Kinds of Sentences
5. Transformation of Sentences

(Note: All the units as covered in the prescribed text.)

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –I

CS- 19 : Elementary Algorithmics

Course Outcomes:

At the end of this course, a student shall be able to:

- apply good principles of algorithm design.
- analyze the searching and sorting patterns
- apply their theoretical knowledge in practically.

Total credits: 03 **Total lectures: 45**

Course content

1. Concepts of Problem, Procedure and Algorithm, Algorithm Representation through Pseudo-Code and Flow-Charts Tracing of Algorithms. Concept of a program and structure of procedure oriented languages. **(07)**

2. Problem Analysis and Design of Algorithms for problems such as (i) Swapping (ii) Counting (3) Finding the Sum, Product, maximum, minimum of a list of numbers, and (iii) Simple variations of the above problems realization that there may be alternative algorithm and that one algorithm may be better (in some sense) than the other. **(06)**

3. Problem Analysis and Design of Algorithms for problems such as (i) Evaluation of a polynomial (ii) Sum of first n factorials (iii) Finding the n^{th} term of Fibonacci sequence, (iv) Finding the largest and second largest of a list,(v) Evaluating finite series and variations of these problems, (vi) Determining n^{th} root of a number **(08)**

4. Introduction to recursive algorithms and their tracing. Applications to (i)Computation of a factorial, sum, maximum, Fibonacci terms (ii) Base conversion (iii) Reversing a String and checking for palindrome property.(4) To compute GCD . **(08)**

5. Concept of array and problems that involve array manipulation (i) Removing the duplicates (ii) Partitioning of an array, (iii) Listing of prime numbers (iv) Finding the prime factor of a number (v) Printing a Histogram. **(08)**

6. The problem of search and merge, Linear, Binary search algorithms. The problem of Sorting, Selection, Insertion, Bubble, Quick, and Merge Sort algorithms. **(08)**

Reference Books:

1. How to solve it by a computer by Dromey R.G.
2. Data Structures, Algorithms and applications in C++ (Ch I I) by Sartaj Sahni

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-II

CS-21 : RDBMS USING ORACLE

Course outcomes:

At the end of this course, a student shall be able to:

- enhance the knowledge and understanding of Database analysis and design.
- enhance the knowledge of the processes of Database Development and Administration using SQL and PL/SQL.
- enhance Programming and Software Engineering skills and techniques using SQL and PL/SQL.

Total credits: 03 **Total lectures: 45**

Course content

1 : Transaction Concepts (10)

Describe a transaction, properties of transaction, state of the transaction.

Executing transactions concurrently associated problem in concurrent execution, Schedules, types of schedules, concept of serializability, precedence graph for Serializability, Ensuring Serializability by locks, different lock modes, 2PL and its variations, Basic timestamp method for concurrency, Thomas Write Rule, Locks with multiple granularity, dynamic database concurrency (Phantom Problem), Timestamps versus locking, Deadlock handling methods, Detection and Recovery (Wait for graph).Prevention algorithms (Wound-wait, Wait-die)

2: Relational algebra (08)

Preliminaries, Relational algebra (selection, projection, set operations, renaming joins, division

3: Relational Database Design (07)

Dependencies: Functional, transitive, multi –valued, Normalization: First, Second, Third normal form, Desirable properties of decomposition (lossless-join, dependency preservation)

4: PL/SQL (10)

Introduction, Syntax, Datatypes, Variables, Control Structure (Conditional & Iterative), block structure

5: Stored Procedure & Triggers (10)

Creating Procedure (Declarative Part, Executable Part), Syntax Applications, Using Procedures, Advantages, functions, Use of database triggers, Types of triggers, Working of Triggers

Reference Books:

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudarshan, Tata McGraw-Hill Education
2. Database Management Systems, Raghu Ramakrishnan, Mcgraw-hill higher Education.
3. Database Systems, Shamkant B. Navathe, Ramez Elmasri, Pearson Higher Education
4. PostgreSQL, Korry Douglas, Sams
5. Practical PostgreSQL (B/CD),John Worsley, Joshua Drake, Shroff/O'reilly
6. Practical Postgresql , By Joshua D. Drake, John C Worsley (O'Reilly publications)
7. "An introduction to Database systems", Bipin C Desai, Galgotia Publications
8. Commercial Application Development Using Oracle Developer 2000,BPB Publications By Ivan Bayross

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester II

CS-22 : PROGRAMMING IN C-II

Course Outcomes:

At the end of this course, a student shall be able to:

- design, implement, test and debug programs that use loops and arrays.
- design, implement, test and debug programs that use functions.
- design, implement, test and debug programs that use arrays for character strings and that use pointers for character strings.
- analyze programming problems to choose when regular loops should be used and when recursion will produce a better program.
- design, implement, test and debug programs that use different data types, such as simple variables, arrays, and structures.

Total credits: 03 **Total lectures: 45**

Course content

1. Arrays (12)

Declaration, entering data into an array, reading data from an array, one dimensional arrays, two dimensional arrays, multi dimensional arrays, arrays and functions, character strings, declaring and initializing string variables, standard library functions, arrays of strings.

2. Structures and Unions (12)

Declaration of structures, initialization of structures, nested structures, Arrays of structures, Declaration of union, initialization of union, differentiate between structures and union.

3. Pointers (12)

Introduction to pointers, pointer declaration ,uses of pointers, applications of pointers, pointer arithmetic, pointer to pointer, pointer to constant object, pointers and arrays, pointers to functions ,pointers to structures.

4 File handling (09)

Introduction, streams, types of files, operations on file standard input-output functions, formatted input-output functions.

References Books:

- Programming in C by S . Kohan
- Born to code in C by H Schildt
- The art of C by H Schildt
- C programming by Kerninghan & Richie – 2 nd edition
- Let us C by Yashwant Kanetkar
- C programming by E- Balaguruswami

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-II

CS-23 : Graph Theory

Course Outcomes:

At the end of this course, a student shall be able to:

- understand graph, various types of graphs, adjacency and incidence matrix.
- perform various types of operations on graph.
- find shortest path of a graph using Dijkstra's algorithm.
- solve Chinese Postman problem and Travelling Salesman problem
- explain concepts of Tree, types of tree and ability to find shortest spanning tree using Kruskal's algorithm

Total credits: 03 **Total lectures: 45**

Course content

Unit 1 : Graphs **(7)**

(1.1) Definition, Elementary terminologies and results, Graphs as Models.
(1.2) Special types of graphs. **(1.3)** Isomorphism.
(1.4) Adjacency and Incidence Matrix of a Graph.

Unit 2 : Operations on Graphs **(8)**

(2.1) Subgraphs, induced subgraphs, Vertex delition, Edge delition, edge contraction.
(2.2) Complement of a graph and self-complementary graphs.
(2.3) Union, Intersection and Product of graphs. **(2.4)** Fusion of vertices.

Unit 3 : Connected Graphs. **(12)**

(3.1) Walk, Trail, Path, Cycle: Definitions and elementary properties.
(3.2) Connected Graphs: definition and properties.
(3.3) Distance between two vertices, eccentricity, center, radius & diameter of a graph.
(3.4) Isthmus, Cut vertex: Definition and properties.
(3.5) Cutset, edge-connectivity, vertex connectivity.
(3.6) Weighted Graph and Dijkstra's Algorithm.

Unit 4 : Eulerian and Hamiltonian Graphs **(8)**

(4.1) Seven Bridge Problem, Eulerian Graph: Definition and Examples, Necessary and Sufficient condition. **(4.2)** Fleury's Algorithm.
(4.3) Hamiltonian Graphs: Definition and Examples, Necessary Condition.
(4.4) Introduction of Chinese Postman Problem and Travelling Salesman Problem.

Unit 5 : Trees **(10)**

(5.1) Definition, Properties of trees. **(5.2)** Center of a tree.
(5.3) Binary Tree: Definition and properties.
(5.4) Tree Traversal : Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal, Prefix Notation.
(5.5) Spanning Tree: Definition, Properties, Shortest Spanning Tree, Kruskal's Algorithm.

Reference Books:

1. Kenneth Rosen, Discrete Mathematics and It's Applications (Tata McGraw Hill)
2. C. L. Liu ,Elements of Discrete Mathematics, (Tata McGraw Hill)
3. John Clark and Derek Holton, A First Look at Graph Theory (Allied Publishers)
4. S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare;
5. Discrete Mathematics; Nirali Prakasha.

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-II

CS-24: Algebra-II

Course Outcomes:

At the end of this course,a student shall be able to :

- understand the concepts of group, types of groups, subgroups and its examples.
- know the terms normal subgroups, its properties and examples.
- understand Homomorphism and Isomorphism, its examples and simple properties.
- explain rings, integral domain, fields and its examples.

Total credits: 03 **Total lectures: 45**

Course content

Unit 1: Groups (20)

(1.1) Binary Operations, Semigroups, Monoids, Groups: Definitions and Examples, Simple, Properties

(1.2) Abelian Group, Finite Group, Infinite Group

(1.3) Order of an element of a Group

(1.4) Subgroups: Definition, Necessary and Sufficient Conditions, Examples on finding subgroups of finite groups, Union and Intersection of Subgroups

(1.5) Cyclic Subgroups: Definition, Simple Properties.

(1.6) Coset : Definition & Simple Properties.

(1.7) Lagrange's theorem (with proof) & its Corollaries.

(1.8) Permutation Groups: Definition of S_n and detail discussion of the group S_3, Cycles and Transpositions, Even and Odd Permutations, Order of Permutation, Properties: a) $0(S_n) = n!$ b) A_n is subgroup of S_n .

Unit 2: Normal Subgroups, Homomorphism & Isomorphism (17)

(2.1) Normal Subgroups: Definition, properties with examples

a) If g is abelian group then every subgroup of G is normal.

b) H is normal subgroup of G iff $xhx^{-1} = H$,

c) H is normal subgroup of G iff every left coset of H in G is also a right coset of H in G. (all with proof).

d) H is normal subgroup of G iff product of two right coset of H in G is also a right coset of H in G

e) If H is subgroup of index 2 in G then H is normal subgroup of G

f) If H is the only subgroup in G of a fixed finite order then H is normal subgroup of G. (all without proof.).

(2.2) Quotient Groups: Definition and Examples

(2.3) Homomorphism and Isomorphism: Definitions, Examples, Simple properties.

Unit 3: Rings & Fields (08)

(3.1) Rings, Integral Domains: Definitions, Some results (without proof), Examples.

(3.2) Fields , Skew Field: Definitions ,Some results (without proof),Examples.

Reference Books:

1. J.B. Fraleigh, A. First Course in Abstract Algebra, Third Ed., Narosa, New Delhi, 1990
2. S.R. Patil, R.S. Bhamare, M.D. Bhagat, D.M. Pandhare; Algebra; Nirali Prakashan, 1998
3. S.R. Patil, R.S. Bhamare, M.D. Bhagat, D.M. Pandhare; Algebra; Nirali Prakashan, 2003.
4. P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul : Basic abstract algebra (second edition).

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) semester II

CS-25 : Principles of Analog Electronics – II

Course Outcomes

At the end of this course, a student shall be able to:

- infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques
- elucidate and design the linear and non linear applications of an op-amp and special application ICs
- explain the concepts of feedback and construct feedback amplifiers and oscillators
- summarizes the performance parameters of amplifiers with and without feedback
- understand the working features of oscillators
- understand the design of power supply and build it

Total credits: 03 **Total lectures: 45**

Course content

1.Differential amplifier (05)

Black box concept; Different modes of operation; Parameters of differential amplifier Differential Amplifier with constant current source; Concept of feedback; Types of feedback

2.Operational Amplifier (15)

Introduction to OP-AMP; Block diagram; Concept of virtual ground; OP-AMP IC 741 OPAMP applications - Inverting and non inverting amplifier, adder, subtractor, comparator, integrator and differentiator; Numerical problems.

3.Oscillators (15)

Introduction to Oscillators; Concept of positive feedback; Barkhausen criteria; Classification of oscillators; Weinbridge oscillator, Phase Shift oscillator; Hartley, Colpitt oscillator; Crystal oscillator; Numerical problems.

4.Power Supply (10)

Review of rectifiers, Types of regulations. Block diagram, working and specifications of regulated power supply, Switching mode power supply **(SMPS**), Uninterrupted power supply **(UPS**)

Reference Books:

1. Integrated circuits by Milliman.
2. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
3. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition,2010
4. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
5. Principals of Electronics: V.K. Mehta, S.Chand and Co.
6. A text book of electrical technology: B.L.Theraja, S.Chand and Co.

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester II

CS – 26 : Principles of Digital Electronics –II

Course Outcomes:

At the end of this course, a student shall be able to:

- understand the concept of flip-flops
- understand the working of counters and implement it
- understand the concept of shift registers and design it
- explain and compare the working of multi vibrators using special application IC 555
- compare the utilization of semiconductor memory

Total credits: 03 **Total lectures: 45**

Course content

1.Flip-flops (15)

Introduction to flip flop, RS flip-flop, Clock R-S flip-flop, JK flip-flop, Master-slave JK flip flop, D and T flip-flop, Race around condition, Triggering in flip-flops, Preset Clear, Delay (Definitions only), Examples of commonly used flip-flops and their applications.

2.Counters (15)

Introductions to counters, Asynchronous counters, Synchronous counter, Modulus of counter, Ring counter , Up-down counter, study of IC 7490 (Internal block diagram) Frequency division in IC 7490(MOD 2,MOD 4, MOD 6 ,MOD 8, MOD 10)

3.Study of shift registers

Serial and parallel data shifting. SISO (right and left shift), SIPO, PIPO and PISO. Study of IC 7495

4.Clock generating circuits (10)

Multivibrators, Introduction to IC555, Working of IC 555 as a clock generator(Astable, monostable, bistable multivibrator), Working of IC 741 as a clock generator (No derivations expected for the above, only formula and problems), Duty cycle, Problems.

5.Semiconductor Memory (05)

Introduction to memory devices, RAM,ROM, PROM,EPROM

Reference Books:

1. Digital Electronics: Jain R.P., Tata McGraw Hill
2. Digital Principles and Applications:Malvino Leach, Tata McGraw-Hill.
3. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester II

CS PIII : COMPUTER SCIENCE PRACTICAL-III

Course outcomes:
After completion of this course a student shall be able to:

- gain the knowledge of PL/SQL Block Structures
- explore the knowledge about PL/SQL control Structures
- work with handling errors, Procedures and triggers.

Total credits: 02

Course content

Practical Examination

A) Internal Marks 40: Completion of journal, attendance and involvement in activities.

B) Semester examination: 60 Marks in One session of 3 Hrs.
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Assignment on nested queries.
2. Introduction to PL/SQL blocks structure.
3. Simple PL/SQL blocks
4. Assignments based on PL/SQL Conditional statements
5. Assignments based on PL/SQL Looping statements
6. Usage of procedures.
7. Assignments based on exception Handling
8. Usage of triggers.

NOTE: At least 8assignments must be performed.

Note: An Industrial visit should be arranged and report should be submitted at the end of academic year.

F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester II

CS PIV : Computer Science Practical -IV

Total credits: 02

Course Outcomes:

At the end of this course, a student shall be able to:

- write simple program using various loops available in C programming language
- understand and implement use of different types of operators and data types
- understand and write program using function
- understand and write program using structure

Course content

Practical Examination

A) Internal Marks 40: Completion of journal, attendance and involvement in activities.
B) Semester examination: 60 Marks in One session of 3 Hrs. 60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Programs using one dimensional and two dimensional array
2. Programs based on character array. (Counting of character words, lines and white spaces etc.)
3. Programs on pointer
4. Programs on Structure and Unions.
5. Programs on structure within structure
6. Programs on File handling.

NOTE : At least 8 assignments must be performed.

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semeter-II

CS EII : Electronics Practical –II

Course Outcomes

At the end of this course, a student shall be able to:

- understand basic concepts for building various applications in electronics.
- understand design procedures of different electronic circuits as per requirement.
- build experimental setup and test the circuits.
- develop skills of analyzing test results of given experiments

Total credits: 02

Course content

- One activity equivalent to 2 experiments by the student.

a. Electronics project

b. Documentation type experiments

c. Presentation/Seminar on Electronics /advanced topic/research topics.

- One activity equivalent to 2 experiments to be arranged by the teacher – Arrange at least two practical demonstrations / Workshops /Industrial visit which will enhance quality and skills of the student.
- Examination will be conducted on 8 experiments as well as on activities

Practical Examination

A) Internal Marks 40: Completion of journal, attendance and involvement in activities.

B) Semester examination: 60 Marks in One session of 3 Hrs.

60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

List of Topics:

1. Study of phase shift oscillator
2. Study of Wein bridge oscillator.
3. Study of Crystal Oscillator.
4. OP-AMP application as an adder
5. OP-AMP application as subtractor
6. OP-AMP application as an integrator
7. OP-AMP application as differentiator
8. Study of 7490 as a counter.
9. Study of flip-flops
10. Study of shift register IC 7495.
11. Study of up down counter
12. Build and Test Diode matrix ROM
13. Study of Four bit Universal Adder/Subtractor

NOTE : At least 8 Practical's must be performed

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester II

CS – 27 : Computer Oriented Statistical Techniques -II

Course Outcomes:
At the end of this course, a student shall be able to:

- distinguish between deterministic and non-deterministic experiments & knowledge related to different types of events.
- understand probability of events including axiomatic approach, simultaneously they are learning conditional probability& knowledge related to concept of discrete and continuous random variable and their probability distributions including expectations and moments.
- understand the important discrete and continuous distributions such as Binomial distribution, Poisson's distribution and Normal distribution.
- acumen to apply standard discrete and continuous distributions to different situations.
- summarize test of significance, small sample test, large sample test and its applications.

Total credits: 03 **Total lectures: 45**

Course content

Unit 1. Probability **(15)**

1.1 Idea of deterministic and non-deterministic models
1.2 Sample space (Finite and countably finite)
1.3 Events: types of events, operations on events
1.4 Probability: classical definition, relative frequency approach, probability models
1.5 Axioms of probability
1.6 Probability of events
1.7 Theorems on probability :

1) $0 \leq P(A) \leq 1$
2) $P(A)+P(A')=1$
3) $P(A) \leq P(B)$ when $A \subset B$
4) $P(A \cup B) = P(A)+P(B)-P(A \cap B)$

1.8 Concept and definitions of conditional probability $P(A \cap B)=P(A)\ P(B/A)$
1.9 Concept and definitions of independence of two events
1.10 Numerical problems

Unit 2. Discrete Random Variables and some Standard Discrete Probability Distributions **(10)**

2.1 Definition of random variable and discrete random variable.
2.2 Definition of probability distribution and distribution, Probability mass function.
2.3 Definition of expectation and variance, theorems on expectation.
2.4 Binomial distribution: definition, mean. Variance, additive property, illustrations of real life situations.
2.5 Poisson distribution: definition, mean, variance, additive property, approximation to binomial, illustrations of real life situations.
2.6 Numerical problems

Unit 3. Continuous random variables and some Standard Continuous Probability Distribution (10)

3.1 Definition through p.d.f.
3.2 Distribution function: definition, statements of properties
3.3 Definitions of mean and variance
3.4 Exponential distribution: p.d.f. with mean, nature of probability curve, mean, variance, lack of memory property.
3.5 Normal distribution: defination of p.d.f., identification of parameters, Probability curve, standard normal distribution.
3.6 Numerical problems

Unit 4. Test of Hypothesis and Some Large and Small sample Tests (10)

4.1 Definitions: random sample, parameter, statistic, standard error of statistic.
4.2 Concept of null and alternative hypothesis, critical region, level of significance, types of error, Concept of test of hypothesis, one sided and two sided tests.
4.3 $H_0 ; \mu = \mu_0$ Vs $H_1 = \mu \neq \mu_0$
4.4 $H_0 = P = Po$ Vs $H_1 = P \neq Po$
4.5 Chi-square test for goodness of fit and 2 X2 contingency table
4.6 t-test for testing $H_0 ; \mu = \mu_0$ Vs $H_1 = \mu \neq \mu_0$
4.7 Numerical problems

Reference Books :

1. Hogg R. V. and Craig, R. G. Introduction to Mathematical Statistics.
2. Hoel. P. G. Introduction to Mathematical Statistics.
3. Feller. W Introduction to probability Theory and it's Applications. Vol –I
4. Mood A. M., Grabill, F. A. Boes D. C. Introduction to Theory of Statistics.
5. Meyar P. L. Introduction to Probability and Statistical Applications.
6. Goon, Gupta and Das Gupta. Fundamentals of Statistics Vol I & II
7. S. P. Gupta. Statistical methods.
8. Waikar and Lev. Elementary Statistical Methods.
9. BIS Publicationn. Statistical Quality Control (Hand Book)
10. ATAG (Automotive Industries Action Group) :SPC/MMS manuals.
11. Samprit Chatterjee and Bertram Price. Regression analysis by Example (1991). John Wiley and sons. Inc.
12. Guilford, J. P. and Fruchter B: Fundamental Statistics in Psychology and Education (1980), Mc Graw Hill.
13. Mathur, Rajiv. Learning Excel-97 for windows step by step Galgotia

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F. Y. B. Sc. (Computer Science)(CBCS 2018 Course) Semester – II
CS 28: Compulsory English – II

Course Outcomes:
At the end of this course, a student shall be able to:

- get exposed to the prose passages, poems and communicative grammar skills
- read and interpret the various types of texts on their own and discuss them among peers
- communicate effectively by developing their proficiency in language
- understand their language abilities and facilitate them to with the necessary online & offline resources

Total Credits: 03 **Total Lectures: 45**

Course Content:

Prescribed Text: ***Views & Visions: An English Course book for Undergraduates*** *by* Orient BS

Prose:

1.	The Task of Education	*Vinoba Bhave*
2.	A Letter by Hazlitt to His Son	*William Hazlitt*
3.	The Bet	*Anton Chekov*
4.	Curious Mishaps	*Vikram Seth*
5.	Refund	*Fritz Karinthy*

Poetry:

1.	Polonius to Laertes	*William Shakespeare*
2.	No Men are Foreign	*James Kirkup*
3.	Stopping by Woods on a Snow Evening	*Robert Frost*
4.	The Golden Pitcher	*Acharya Vidyasagar Maharaj*

Grammar, Usage and Composition:

1. Degrees of Comparison
2. One-word Substitution
3. Synonyms and Antonyms
4. Paragraph Writing
5. Reading Comprehension
6. Summarising

(Note: All the units as covered in the prescribed text.)

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-II

CS-29 : Operating Environment

Course Outcomes:

At the end of this course a student shall be able to:

- study the computer fundamentals
- apply knowledge of computer structure
- understand concepts of information technology
- develop skills of practically MS Office package

Total credits: 03 **Total lectures: 45**

Course content

1. Computer definition, uses, block diagram, functions of ALU, input/output, scanner, plotter, keyboard, mouse, MICR, bar decoder, OCR, joystick, monitor, printer, memory unit and CPU. **(07)**
2. Software-types, compilers, interpreter, assembler, linker, loader, high level and low-level languages. Files-types and operations, indexed, sequential and hashed organization. Sorting, merging, indexing and updating functions, concept of a file allocation table. **(10)**
3. Operating System-types-timesharing, batch processing, multiprogramming, real- time; functions of operating systems – Introduction to file management, detailed study of DOS and Windows. **(08)**
4. Networking - Data communication concepts, classification, communication media, LAN, Wan, Man, Internet, Intranet, Extranet , and their efficient use. **(10)**
5. Study of office 2000(MS-Word, MS-Power Point, MS-Excel) **(10)**

Reference Books :

1. A First course in computers by Ravi Saxena
2. Computer Fundamentals :Milind Oak
3. Computer Fundamentals : P.K.Sinha

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F.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-II

UGSEC 21 : HTML Programming

Course outcomes:

After completion of this course a student shall be able to:

- create local HTML pages
- design and develop basic web pages using HTML and CSS.
- use graphics in Web pages.
- use tables in Web pages.

Total credits: 02 **Total lectures: 30**

Course Content

Unit- 1 Introduction **(03)**

HTML file structure, HTML tags, types of tags

Unit-2 The Basics **(05)**

The Head, Body tag, Colors, Attributes Lists, ordered and unordered

Unit-3 Links **(05)**

Introduction, Relative Links, Absolute Links, Link Attributes, Using the ID Attribute to Link within a Document

Unit-4: Images **(08)**

Putting an Image on a Page, Using Images as Links, Putting an Image in the Background

Unit 5: – Tables **(04)**

Creating a Table, Table Headers, Captions, Spanning Multiple Columns, Styling Table

Unit 6 – Forms **(05)**

Basic Input and Attributes, Other Kinds of Inputs, Styling forms with CSS

Book Recommended:

1. Introduction to **HTML** and CSS -- O'Reilly, 2010
2. HTML, DHTML, JavaScript, Perl CGI-Ivan Byross

Software Lab Based on HTML:

Q.1. Create an HTML document with the following formatting options:

I. Bold II. Italics III. Underline IV. Headings (Using H1 to H6 heading styles)

V. Font (Type, Size and Color) VI. Background (Colored background/Image in background)

VII. Paragraph VIII. Line Break IX. Horizontal Rule

X. Pre tag

Q.2. Create an HTML document which consists of:

I. Ordered List II. Unordered List

III. Nested List IV. Image

Q.3. Create an HTML document which implements Internal linking as well as External linking.

Q.4. Create a table using HTML which consists of columns for Roll No., Student's name and grade.

Roll No.	Name	Grade

Q.5. Create HTML documents having multiple frames.

Q.6. Create HTML documents using input tags to design student registration form.

Q.7. Create HTML documents to add audio and video file on web page.

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS -31 : Object Oriented Programming with C++

Course Outcomes:

After completion of this course, a student shall be able to:

- perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.
- demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
- demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.

Total credits: 04 **Total lectures: 60**

Course content

Prerequisite: Knowledge of C Programming Language

1. Principles of Object oriented Programming [04]

Object oriented concepts; Features, advantages and Applications of OOPS

2. Introduction to C++ Programming Language [08]

Tokens, Expressions ,Control structures; Data types, new operators and keywords, using namespace concept; Simple C++ Program; Introduction to Reference variables; Usage of 'this' pointer; Classes and Objects; Access specifiers; Defining Data members and Member functions; Array of objects

3. Functions in C++ [12]

Call by reference, Return by reference; Function overloading and default arguments; Inline function; Static class members; Friend Concept – Function, Class

4. Constructors and destructor [05]

Constructor; Types of constructors; Memory allocation (new and delete); Destructor

5. Operator overloading [08]

Overloading function; Overloading Unary and Binary operators; Overloading using friend function; Type casting and Type conversion

6. Inheritance [06]

Types of inheritance with examples; Constructors and destructor in derived classes; Virtual base classes, Virtual functions and Pure virtual function; Abstract base classes

7. Managing Input and Output using C++ [05]

Managing console I/O; C++ stream classes; Formatted and unformatted console I/O; Usage of manipulators

Reference Books :

1) Object Oriented programming with C++ 4th Edition by e .Balaguruswamy, Tata Mc-Graw Hill Publication.
2) The C++ Programming Language by Bjarne Stroustrup, Addison Wesley, 2000
3) Object oriented programming in C++, Robert Lafore, Galgotia Publication.

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS-32 : Introduction To .Net Using C#

Course Outcomes:

At the end of this course, a student shall be able to :

- Giving the students the insides of the .net environment in c#.
- It covers the concepts of web servers and web application, server design methodology with an object oriented concepts, client side programming, server side programming
- It also covers usage of recent platform used in developing web applications such as .Net environment like C# and Asp.net

Total credits: 04 **Total lectures: 60**

Course content

1) **Introduction to .Net Technology:** **(12)**

.Net Framework, common Language Runtime, Common Language Specification, Intermediate Language Code, Just-In-Time Compiler, Assemblies, Manifest, Metadata ,Global assembly Cache

2) Introduction TO C# **(10)**

Introducing C#, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations

3) Exception Handling **(10)**

Using Structured Exception(try-catch-finally

4) Windows Forms using C# : **(10)**

Text Box, Buttons, Labels, Checks Boxes, radio Buttons, List Boxes, Combo Boxes, Picture Boxes, Scrollbars, Timer, Menus, Built-in Dialogs, Image List, Toolbars, Status Bar and Progress bars, Event and Delegates, Tracing, Debugging

5) Object Oriented Programming: **(10)**

Class and Objects Properties, methods and events, Constructor and Destructor, Method overloading, Inheritance, Access modifiers(Public, Private, Protected, Friend), Overriding and shadowing, Interfaces, Polymorphism, Private and Shared Classes

6) File Handling: **(08)**

File stream class, Stream Writer, Stream Reader, Binary Reader, Binary Writer Classes, File and Directory Classes

TEXT BOOKS:

1. E. Balagurusamy, “Programming in C#”, Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, “Programming C#”, 2nd ed., O’Reilly, 2002. (Unit III, IV, V)

REFERENCE BOOKS:

1. Herbert Schildt, “The Complete Reference: C#”, Tata McGraw-Hill, 2004.
2. Robinson et al, “Professional C#”, 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, “C# and the .NET Platform”, A! Press, 2003.
4. Thamarai Selvi, R. Murugesan, “A Textbook on C#”, Pearson Education, 2003.
5. Programming Microsoft ASP.NET Dino Esposito

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS– 33 : Linear Algebra

Course Outcomes:

At the end of this course, a student will be able to:

- summarize linear system, matrix transformation, solution of linear systems of equations and LU decomposition.
- understand the real vector spaces, subspaces, linear independence, basis and dimensions.
- find linear independence, linear span, basis and dimension of vector spaces.
- understand the concepts of eigen values and eigen vectors and diagonalization.
- solve kernel and range of linear transformation

Total credits: 04 **Total lectures: 60**

Course content

[1] Linear Equations and Matrices **[15]**

(1.1) Linear systems (1.2) Matrices

(1.3) Dot Product and Matrix Multiplication (1.4) Matrix Transformations

(1.5) Solutions of Linear Systems of Equations (1.6) LU- Factorization.

[2] General Vector Spaces **[15]**

(2.1) Real vector spaces. (2.2) Subspaces.

(2.3) Linear independence. (2.4) Basis and dimensions.

(2.5) Row space, column space and null space. (2.6) Rank and Nullity.

[3] Eigen values and Eigen vectors **[15]**

(3.1) Eigen values and Eigen vectors. (3.2) Diagonalization.

(3.3) Quadratic forms.

(3.4) Using scilab : (i)Find Eigen values and Eigen vectors. (ii) Diagonalization

[4] Linear Transformations **[15]**

(4.1) General linear transformations.

(4.2) Kernel and range. (Rank nullity theorem without proof.)

(4.3) Inverse linear transformation. (4.4) Matrix of general linear transformation

TEXT BOOKS:

(1) S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Nirali Prakashan

(2) S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Vision Publication

(3) F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Nirali Prakashan

(4) F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Vision Publication

(5) Elementary Linear Algebra (Applications Version) by Howard Anton, Chris Rorres. (Seventh Edition) John Wiley & Sons, Inc. Sections: 5.1 to 5.6, 7.1, 7.2, 9.5, 9.6, 8.1 to 8.4

(6) Discrete Mathematical Structures (sixth edition), Kolman, Busby and Ross. PHI. Sections: 9.5, 11.1 to 11.3

REFRENCE BOOKS:

(1) M. Artin, Algebra, Prentice Hall of India , New Delhi, (1994).

(2) Hoffmann and Kunze Linear Algebra, Second Ed. Prentice Hall of India New Delhi, (1998)

(3) S. Lang, Introduction to Linear Algebra, Second Ed. Springer-Verlag, New Yark, (1986).

(4) A. Ramchandra Rao and P. Bhimasankaran, Linear Algebra, Tata mcgraw Hill, New Delhi (1994).

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS-34 : Computer Oriented Numerical Methods

Course Outcomes :

At the end this course, a students will be able to :

- understand and explain forward and backward pass computation, critical path of PERT and CPM terms.
- solve non- linear equation by using bisection, secant, regula-falsi, Newton-Raphson methods.
- understad creating a polynomial by using Newton's backward and forward formulae, Lagrange's interpolation formula, Hermite interpolation.
- solve integration by using bisection, secant, regula-falsi, Newton-Raphson methods.
- solve differential equation examples on Euler's method, Runge-Kutta second and fourth order formula.

Total credits: 04 **Total lectures: 60**

Course content

[1] PERT and CPM Computations [12]

(1.1) Phases of project schedulding
(1.2) Network logic , numbering the events (Fukerson's rule.)
(1.3) Measure of activity
(1.4) PERT: forward and backwad pass computations slack , critical path.
(1.5) CPM terms, critical path, float.
(1.6) Using scilab
i. Use of ' deff ' command for one and two variables functions.
ii. Draw 2-D and 3-D graph for some standard functions. E.g. x^2 , sin (x), exp(x), x^3+y^3 etc .

[2] Solutions of Non – linear Equations [12]

(2.1) Location of Roots
(2.2) Bisection, Secant, Regula-Falsi and Newton-Raphson methods, Comparison Of these methods
(2.3) Acceleration of convergence Aitken's Process
(2.4) Regula-Falsi method and Newton-Raphson method using Scilab.

[3] Polynomial Interpolation & Approximation [12]

(3.1) Finite differences: Forward, Backward and Central
(3.2) Detection of errors using different tables
(3.3) Newton's backward and forward formulae for interpolation
(3.4) Lagrange's interpolation formulae for unequal intervals
(3.5) Least square approximation by Polynomials up to third degree
(3.6) Hermite Interpolation.
(3.7) Newton Forward, Newton Backward and Lagrange's Interpolation by using Scilab

[4] Numerical Differentiation and Integration [10]

(4.1) Numerical differentiation using interpolating polynomials
(4.2) Trapezoidal rule, Simpson's $(1/3)^{rd}$ rule and Simpson's $(3/8)^{th}$ rule
(4.3) Extrapolation to the limit : Ramberg Interpolation
(4.4) Numerical integration by Simpson's (1/3)rd, numerical integration by Simpson's (3/8)th rule, rule by using Scilab

[5] Solution of Ordinary Differential Equations &solution of Simultaneous Linear Equations **[14]**

(5.1) Numerical Integration By Tayler Series
(5.2) Euler's method
(5.3) Runge-Kutta method: 2^{nd} and 4^{th} orders
(5.4) Predictor corrector method
(5.5) Gaussian Elimination, Pivoting Strategy, Conditional Equations
(5.6) Modification of Gaussian Elimination to Compute Inverse of Matrix
(5.7) Comparison of direct and iterative methods
(5.8) Examples on Euler's method, Runge-Kutta second and fourth order formula by using Scilab.

TEXT BOOK

Prof S.R.Patil; Prof S.G.Gujrathi; Prof D.M. Pandhare; Numerical Methods And Operation Research; Nirali Prakashan,1998.

REFRENCE BOOKS:

1.S.S.Sastry; Introductory methods of Numerical Analysis ; Prentice-Hall of India (3^{rd} edition) 2000
2. J.H.Mathews; Numerical methods for Mathematics, Science and Engineering (2^{nd} edition); Prentice-Hall of India ,1994.
3. R.J. Dromey; How To Solve It By Computer; Prentice-Hall Of India; 1982
4. Anthony Ralston,Philip Rabinowitz; A First Course in Numerical Analysis; (2^{nd} edition) International Student edition; mcgraw-Hill Book Company; TOKYO; 1978
5. Computer Oriented Numerical Methods-Rajaraman.
6. Introduction To Numerical Analysis-C.E. Froberg.
7. Introduction To Applied Numerical Analysis-C.E.Froberg.
8. Numerical Methods that works-Forman S. Action.
9.Numerical Methods in Fortran-J.M.Mcormik.
10. Numerical Methods For SC & Engg - R.G.Stanton (Prentice Hall)

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS-35 : Digital systems and Microprocessors

Course outcomes:

At the end of this course, a student shall be able to:

- explore the concept of data convertors and its applications.
- implement memory concepts for digital circuit design.
- understand and apply the concepts of microprocessors
- explain the behaviour of multicore technology

Total credits: 04 **Total lectures: 60**

Course content

1. Data Converters (12)

Digital to Analog Converter (DAC): Resistive divider, R-2R ladder, Parameters of DAC. Analog to Digital Converter (ADC): Types of ADC- Flash, Successive approximation, dual slope. Parameters of ADC. Applications of DAC and ADC .

2. **Memory organization (16)**

Memory Architecture, Memory Hierarchy, Introduction to USB storage device, Memory parameters like Access time, speed, capacity, cost , Associative Memory, Cache memory, cache mapping techniques, virtual memory, virtual memory mapping: paging and segmentation.

3. Computer Organization (16)

Concept of Address Bus, Data Bus, Control Bus. Register based CPU organization, stack organization, I/O organization: need of interface, block diagram of general I/O interface. Working concepts like polling, interrupt initiated data transfer.

Concept of DMA , DMA transfer, DMA Controller Serial communication: Synchronous, asynchronous and their data transmission formats, RS–232, General block diagram of PPI and UART

4. Microprocessor (16)

Evolution of Microprocessor (8086 to Pentium 4) General register organization, Stack Organization, Instruction formats, Addressing modes .Generations of microprocessors, general operation of microprocessors Concept of RISC and CISC, Von-Neumann & Harvard Architecture Concept of pipeline. Architecture of basic microprocessors 8086 and basic version of Pentium .Concept of multicore processors.

Reference books

1. Microprocessor and interfacing by Douglas Hall, Tata Mcgraw-Hill Edition
2. Computer organization and Architecture by William Stallings
3. The Intel Microprocessor by Barry B.Brey.
4. Computer architecture and organization by Rifiqzaman and Chandra.
5. Computer Organization J.P. Hays TMH
6. The Pentium Microprocessor by James Antonakos(PEA)
7. The Intel Microprocessor by Barry.B.Brey
8. Digital design : M. Morris Mano, Prentice-Hall of India

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS-36 : Principles of Communication

Course outcomes

At the end of this course, a student shall be able to:

- Apply the basics of communication systems in day today life
- Implement the techniques modulation, demodulation and multiplexing of signals
- Analyze and use digital communication techniques
- Analyze the concepts in advanced wireless communication

Total credits: 04 **Total lectures: 60**

Course content

1. **Introduction to Electronics Communication (10)**
   Importance of Communication, Elements of communication systems Electromagnetic spectrum, type of communication, Concepts of communication system: channel bandwidth, Nyquist theorem, S/N ratio, channel capacity, error handling, Shannon theorem, concept of companding, Data rate, baud rate, serial communication and protocol.
2. **Modulation and Demodulation. (18)**
   Introduction to concepts of modulation and demodulation. Modulation techniques: Analog modulation: Amplitude, Phase and Frequency modulation, Circuit diagram and working of transistorized amplitude modulator and diode demodulator. Equation of amplitude modulated wave, modulation index and frequency spectrum.
   Digital modulation, PAM, PCM, delta modulation, MODEM – concept of ASK, FSK, QPSK, MSK, GMSK.
3. **Multiplexing and Multiple Access Techniques. (16)**
   Multiplexing ,Space division multiplexing, Time division multiplexing, Frequency Division Multiplexing, Code division multiplexing, Introduction to multiple access, FDMA, TDMA,CDMA
4. **Introduction to wireless and Mobile Communication. (16)**
   Introduction to wireless communication system and its concept. Introduction to antennas, working principle and parameters of antenna. Introduction to mobile communication, Cellular concept, Working of GSM: Hand over, Introduction to GPRS, Wi-Fi and blue tooth Applications. Introduction to RFID, Zigbee.

Recommended Books:

1. Digital and Data Communication, 4th edition by Micheal A. Miller.
2. Communication Electronics by Frenezel Louis E.
3. Wireless Communication, 2nd edition. Rappaport.
4. Mobile Communication. Schiller Jochen.
5. Wireless Communications and Networks. William Stallings

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS PV: Computer Science Practical - V

Course outcomes:

At the end of this course, a student shall be able to :

- understand how **C++** improves C with object-oriented features.
- learn how to write inline functions for efficiency and performance.
- learn the syntax and semantics of the **C++ programming** language.
- learn how to design **C++** classes for code reuse

Total Credits 2

Course Content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .
40 marks: Practical work 30 marks and 10 marks for oral

PROGRAM LIST IN C++

1. Write a program in C++ to implement class concept for creating and displaying employee data.
2. Write programs in C++ to implement function overloading and operator overloading(unary, binary , relational).
3. Write a program in C++ to implement Write a program in C++ to implement virtual function.
4. Write a program in C++ to implement constructor and destructor to calculate net salary of n employees.
5. Write a program in C++ to implement the concept of inline functions.
6. Write a program in C++ to use scope resolution operator for member definition.
7. Write a program in C++ to implement how a function can act as a friend with one or more classes.
8. Write programs in C++ to implement simple, hybrid, multiple , multilevel inheritance ..

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS PVI: Computer Science Practical - VI

Course outcomes:

At the end of this course, a student shall be able to :

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

Total Credits 2

Course Content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .
40 marks: Practical work 30 marks and 10 marks for oral

1. Create basic calculator utility in c#.
2. Write c# program using timer & progress bar controls
3. Write a program in c# using list box control , check box control, radio buttons**.**
4. Write program in c# for implementing single and multiple inheritance.
5. Write program in c# for implementing interface, polymorphism
6. Write c# program for exception handling. (Try-Catch)
7. Write program using File handling in c#
8. Write program using control structures.

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS EIII: Electronics Practical -III

Course outcomes:

At the end of this course, a student shall be able to :

- Use of basic concepts for building various applications in electronics.
- Understand design procedures of different electronic circuits as per requirement.
- Build experimental setup and test the circuits.
- Develop skills of analyzing test results of given experiments.

Total Credits 2

Course Content

- Examination will be conducted on 8 experiments .

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B)Semester examination: 60 Marks in One session of 3 Hrs .

60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribution of 50 marks

Circuit diagram / flowchart and algorithm	15	
Connection / program		10
Demonstration and working explanation		10
Observation table		10
Result analysis / conclusion	05	

(Note : Any 8 experiments should be performed)

1. Study of SMPS.
2. Study of 8038 function generator.
3. DC motor drive and speed control.
4. I-V characteristics temperature sensor AD 590.
5. Analog multiplexers.
6. Analog to Digital converter using discrete components/IC LM 234/74148 or IC 7109/Flash ADC
7. Digital to Analog converter using discrete components.
8. Comparison of Monostable using IC-741 and IC-74121.
9. Simple assembly language program : addition,subtraction
10. Simple assembly language program: multiplication, division
11. Simple assembly language program to find smallest and largest number.
12. LM-35 based temperature sensing system/Optocoupler /opto-isolator base system.
13. Low Pass Filter and High Pass Filter using IC-741 Op Amp.
14. Build and test Hamming Code generator and detector circuit

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS-37 : Cloud Computing - I

Course Outcomes:

At the end of this course, a student shall be able to:

- understand the concepts of cloud computing
- apply cloud computing environment.
- use various platforms
- employ various applications that uses cloud computing

Total credits: 04 **Total lectures: 60**

Course content

1.Introduction to cloud computing: (14)

Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private Public and hybrid clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, , Cloud computing delivery models and services (IaaS, PaaS, SaaS), obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, Practical applications of cloud computing.

2. Cloud Computing Companies and Migrating to Cloud : (14)

Web-based business services, Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud., Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies

3. Cloud Cost Management and Selection of Cloud Provider: (14)

Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, Selecting the right scalable application. Considerations for selecting cloud solution. Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration

4. Governance in the Cloud: (12)

Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations

5.Cloud deployment models: (6)

public cloud model, private cloud model, hybrid cloud model, community model.

Reference Books:

1. Cloud Computing: A Practical Approach for Learning and Implementation - Srinivasan
2. Cloud Computing : Rajiv Chopra, New Age International Publications
3. Cloud Computing Implementation, Mangement & Security: John W.Rittinghousa, CRC Press
4. Handbook on Cloud Computing, BorivojeFurht, Armando Escalante, Springer, 2010

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

CS-38 : Data Warehousing and Data Mining- I

Course Outcomes:

At the end of this course, a student shall be able to:

- design the database architecture for storing large data.
- understand and implement various algorithms used for data mining
- analyze the data using existing data mining tools

Total credits: 04 **Total lectures: 60**

Course content

1 . Overview of DBMS **(6)**

DBMS concepts, Types of DBMS, SQL, and Database query processing

2. Introduction to Data Warehousing **(12)**

Introduction to data warehousing, definition, characteristics of data warehouse, Need, Benefits of a separate data warehouse, evolution of decision support systems, Data warehouse life cycle, building a data warehouse, Data Warehousing Components, Data Warehousing Architecture

3. Multi-dimentional Data Models **(12)**

Data models, Tables, spreadsheets and data cubes, data Marts and types of data marts

4. OLAP and OLTP **(10)**

Concepts, On Line Analytical Processing, Categorization of OLAP Tools, OLAP operations, types of OLAP servers: ROLAP, MOLAP, HOLAP

5. Data Warehouse Design **(10)**

Design, Process of data warehouse design, three tier architecture, back end tools and utilities

6. **Introduction to Data mining** **(10)**

Definition, need for data mining, KDD process, Data mining architecture, Data Mining Functionalities

Reference Books :

1. Data mining concepts and techniques - Jiawei Han and Micheline Kamber
2. Data Mining Data Warehousing- Nilesh magar, Vision Publication
3. Data Mining Techniques- Dr. Arun K. Pujari, Universal Press
4. Principles of Data Mining – Bramer, Springer

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S.Y.B.Sc. (Computer Science) (CBCS 2018) Semester –III

UGSEC-31 : Programming In Python

Course Outcomes:

At the end of this course, a student shall be able to:

- apply the various concepts of programming using Python.
- apply the problem solving skills using Python
- implement the python platform in various applications

Total credits: 02 **Total lectures: 30**

Course content

1. Introduction to Python Scripting (4L)

Why Scripting is Useful in Computational Science, Classification of Programming Languages, Productive Pairs of Programming Languages, Gluing Existing Applications, Scripting Yields Shorter Code, Efficiency, Type-Specification (Declaration) of Variables, Flexible Function Interfaces, Interactive Computing, Creating Code at Run Time, Nested Heterogeneous Data Structures, GUI Programming, Mixed Language Programming, When to Choose a Dynamically Typed Language, Why Python?, Script or Program?

2. Basic Python (6L)

Python identifiers and reserved words, Lines and indentation, multi-line statements, comments, Input/output with print and input functions, command line arguments and processing command line arguments, standard data types - basic, none, boolean (true & False), numbers, Python strings, data type conversion, Python basic operators (Arithmetic, comparison, assignment, bitwise logical), Python membership operators (in & not in), Python identity operators (is & is not), Operator precedence, Control Statements, Python loops, Iterating by subsequence index, loop control statements (break, continue, pass) , Mathematical functions and constants (import math), Random number functions

3. Python strings (6L)

Concept, Slicing, escape characters, String special operations, String formatting operator, Triple quotes, Raw String, Unicode strings, Built-in String methods. Python Lists - concept, creating and accessing elements, updating & deleting lists, basic list operations, reverse, Indexing, slicing and Matrices, built-in List functions, Functional programming tools - filter(), map(), and reduce(), Using Lists as stacks and Queues, List comprehensions

4. Python tuples and sets (6L)

Concept (immutable), creating & deleting tuples, accessing values in a tuple, updating tuples, delete tuple elements, basic tuple operations, Indexing, slicing and Matrices, built- in tuple functions. Sets - Concept, operations, dictionary.

5. Python Classes / Objects (8L)

Object oriented programming and classes in Python - creating classes, instance objects, accessing members, data hiding (the double underscore prefix), built-in class attributes, garbage collection, the constructor, overloading methods and operators, inheritance - implementing a subclass, overriding methods, Recursive calls to methods, Class variables, class methods, and static methods

Reference Books

1. Introducing Python- Modern Computing in Simple Packages – Bill Lubanovic, O'Reilly Publication

2. Magnus Lie Hetland, Beginning Python: From Novice to Professional, Apress
3. Paul Gries, et al., Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014
4. Introduction to Computer Science Using Python- Charles Dierbach, Wiley Publication Learning with Python ", Green Tea Press, 2002
5. E-Books :python_tutorial. pdf, python_book_01.pdf
6. Beginning Programming with Python for Dummies Paperback – 2015 by John Paul Mueller
7. A Beginner's Python Tutorial: http://en.wikibooks.org/wiki/A Beginner%27s Python Tutorial.

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS - 41 : Data Structures using C++

Course Outcomes:

At the end of this course, a student shall be able to:

- teach fundamental data structures, which allow one to store collections of data with fast updates and queries.
- efficiently implement the different data structures.
- efficiently implement solutions for specific complex problems.

Total credits: 04 **Total lectures: 60**

Course content

Prerequisites: Students are expected to be proficient in a high-level object oriented programming language like C++

1. Introduction to data structures (6)

Abstract Data type, data object, data structures, algorithm analysis, space and time complexity

2. Sorting and searching techniques (10)

Bubble, Selection, Insertion, Shell sorts and Sequential, Binary, Indexed Sequential Searches, Binary Search Tree Sort, Heap sort, Radix sort

3. Stack and queue (12)

Stacks: LIFO structure, create, POP, PUSH, multiple stacks, hashing, applications

Queues: FIFO structure, Priority Queues, Circular Queues, operations on Queues

4. Linked lists (12)

Concept, Node structure ,Types of linked list, Linked List Data Structure and operations like Create List, Insert Node (empty list, beginning, Middle, end), Delete node(First, general case), Search list, Retrieve Node, add node, Remove node, Print List , Circularly-Linked List , Doubly Linked List(Insertion, Deletion)

5. Trees (10)

Tree terminologies, binary tree concept, types of binary trees, operations performed on it , binary Search tree ,Expression trees, AVL trees ,threaded binary tree, Tree traversals, applications.

6. Graphs (10)

Definition, types of graph , terminologies , representation in memory, graph data structures, Operations on graph, Breadth first search, Depth first search , Shortest path problem, spanning tree concept ,topological sort.

References:-

1. Data Structures and Algorithm Analysis in C++, Michael T. Goodrich, Wiley student edition, 2007.
2. Data Structures Using C++, Sahni ,The McGraw-Hill, 2006.
3. Schaum's Outlines Data structure, Seymour Lipschutz, Tata McGraw Hill 2nd Edition
4. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education , 1997
5. Data Structures Using C and C++ by Tanenbaum amd Moshe, 1998

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS-42 : ASP.Net

Course Outcomes:

At the end of this course, a student shall be able to:

- create a Web form with server controls.
- Separate page code from content by using code-behind pages, page controls, and components.
- Display dynamic data from a data source by using Microsoft ADO.NET and data binding.
- Debug ASP.NET pages by using trace.

Total credits: 04 **Total lectures: 60**

Course content

1) Introduction to ASP.NET (8)

Asp.net Component Model, ASP.NET Development Stack, Difference between C# and ASP.NET

2) Introduction to ADO.NET (10)

.Net Data Access Infrastructure, Connected Architecture using ADO.Net, Data reader, Connection objects, command Objects.

3) Disconnected architecture using ADO.Net (10)

Data adapters, and Datasets, Data binding with controls, Navigating data source ,Data from wizard

4) Crystal Report (10)

Connection to Database, Building Reports, Modifying Report, Header, Footer, Details, Group Header, Group Footer, Summary ,Working with Multiple tables

5) Web application: (8)

Introduction to Web form, page directive, Page redirection

6) Web services: (8)

Concept of web services, Create a small web services

7) Deployment: (6)

Deploying applications using wizard

TEXTBOOKS:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

REFERENCE BOOKS :

1. Herbert Schildt, "The Complete Reference: C#", Tata McGraw-Hill, 2004.
2. Robinson et al, "Professional C#", 4th ed., Wrox Press, 2002.
3. Andrew Troelsen, "C# and the .NET Platform", A! Press, 2003.
4. Thamarai Selvi, R. Murugesan, "A Textbook on C#", Pearson Education, 2003.
5. Programming Microsoft ASP.NET Dino Esposito

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS-43 : Computational Geometry

Course Outcomes

At the end of this course, a student shall be able to :

- understand how to represent point, lines, transformation and matrices, various types of transformation.
- solve multiple transformation and projection on three dimensional.
- find equidistance points on ellipse, circle, parabola, hyperbola.
- understand the concepts Beizer curve , its properties and B-spline curve.

Total credits: 04 **Total lectures: 60**

Course content

[1] Two Dimensional Transformations [19]

(1.1) Introduction (1.2) Representation of points
(1.3)Transformation and matrices (1.4) Transformation of points
(1.5) Transformation of straight line (1.6) Midpoint transformation
(1.7) Transformation of parallel lines (1.8) Transformation of intersecting lines
(1.9) Transformations: rotation, reflection, scaling, shearing
(1.10) Concatenated transformations (1.11) Transformation of a unit square
(1.12) Solid body transformations (1.13) Translations and homogeneous coordinates
(1.14) Rotation about an arbitrary point (1.15) Reflection through an arbitrary line
(1.16) Overall scaling , point at infinity
(1.17) Projection – a geometric interpretation of homogeneous cordinates

[2] Three Dimentional Transformations [19]

(2.1) Introduction
(2.2) Three Dimentional-Scaling, Shearing , Reflection, Translation,Rotation
(2.3) Multiple Transformation
(2.4) Rotation About - an axis parallel to a coordinate axis, an arbitrary axis in space
(2.5) Reflection through an arbitrary plane. (2.6) Affine and Perspective Geometry.
(2.7) Orthographic Projections. (2.8) Axonometric Projections.
(2.9) Oblique Projections (2.10) Single Point Perspective Transformations.
(2.11) Vanishing Points

[3] Plane Curves [19]

(3.1) Introduction (3.2) Curve representation
(3.3) Non-parametric curves. (3.4) Parametric curves.
(3.5) Parametric representation of circle. (3.6) Parametric representation of ellipse.
(3.7) Parametric representation of parabola. (3.8) Parametric representation of hyperbola

[4] Space Curves [03]

(4.1) Beizer Curves –Introduction , Definition, Properties (without proof), Curve Fitting (Upto n=3), Equation of Curves in Matrix form (upto n=3)
(4.2) B-Spline Curve-Introduction ,Definition, Properties (without proof)

TEXT BOOKS:

1. S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Nirali Prakashan
2. S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Vision Publication

3. S.Y.B.Sc. (Computer Science) Sem.-II, Paper-I, Computational Geometry, Nirali Prakashan
4. S.Y.B.Sc. (Computer Science) Sem.-II, Paper-I, Computational Geometry, Vision Publication
5. F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Nirali Prakashan
6. F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Vision Publication
7. D. F. Rogers, J. A. Adams, Mathematical elements for Computer graphics, Mc Graw Hill Intnl Edition.

REFRENCE BOOKS:

(1) G.S. Pandey And R.R.Sharma; Vector and Geometry ; Wishwa Prakashan
(2) P. Balsubrahamanyam, K.G. Balsubrahamanyam, G.R.Venkataraman; Coordinate Geometry of two and three Dimensions; Tata mcgraw-HILL, New Delhi
(3) David F. Rogers, J Alan Adams; Mathematical Elements for Computer Graphics (Second Edition); mcgraw-HILL International Editions.1990
(4) William M. Newman, Robert F. Sproul; Principles of Interactive computer Graphics (Second Edition); International Student Edition, Mcgraw-Hill Book company, Tokyo. 1979.

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS-44 : Optimization Techniques

Course Outcomes

At the end of this course, a student shall be able to :

- understand formulation of L.P.P., graphical method and simplex method, duality of L.P.P.
- find the initial basic feasible solution and optimal solution by using North-West corner method, Least cost method, VAM method, MODI method of transportation problem.
- find initial optimal solution by using Hungarian method with their types.
- understand the concept of game, ability to solve game by using graphical method and dominance method

Total credits: 04 **Total lectures: 60**

Course content

[1] Linear Programming :- **[15]**

(1.1) Advantages, Limitations, Definitions, Terminology, Formulation of L.P.P.
(1.2) Solution by Graphical Method & Simplex Method, special Cases
(1.3) Duality – concept, Interrelation between a Primal and Dual, Advantages, Interpretation of dual
(1.4) Solution of L. P. P. by simplex method (verification by TORA **)**

[2] Transportation Problems :- **[18]**

(2.1) Introduction, General structure of transportation problem
(2.2) Unbalanced transportation problem
(2.3) North-West Corner Method, Least Cost Method, Vogel's Approximation Method
(2.4) MODI Method
(2.5) Degeneracy in transportation problem
(2.6) Maximization in transportation problem
(2.7) Prohibited transportation problem
(2.8) Numerical problems
(2.9) Transportation problem (verification by TORA)

[3] Assignment Problems :- **[17]**

(3.1) Statement and mathematical representation of assignment problem
(3.2) Unbalanced assignment problem
(3.3) Hungarian method of solving A.P. (Minimization Case)
(3.4) Maximization assignment problem
(3.5) Multiple assignment problem
(3.6) Prohibited assignment problem
(3.7) Numerical problems
(3.8) Assignment problem (verification by TORA)

[4] Theory of games **[10]**

(4.1) Two persons zero sum game, pure and mixed strategies, statement of The mini-max theorem
(4.2) Graphical method for solving 2xm principles and dominance and Nx2 games and solving some simple games
(4.3) Connection between the game problem and L. P. P., Simple games

TEXT BOOK:

Prof S.R.Patil; Prof S.G.Gujrathi; Prof D.M. Pandhare;
Numerical Methods And Operation Research; Nirali Prakashan,1998.

REFRENCE BOOKS:

1. R.J. Dromey; How To Solve It By Computer; Prentice-Hall Of India; 1982
2. V.K.Kapoor; Operations Research; Sultan Chand & Sons Educational Publishers, New Delhi; 1985.
3. S.D.Sharma; Operations Research;Kedar Nath Ram Nath & Co. Publishers, Meerut, 1972.
4. L.C. Jhambh; Quantitative Techniques Vol I & II; Everest Publishing House, Pune-1998.
5. N.D. Vohra; Quantitative Techniques in Management (Second Edition); Tata mcgraw-Hill Publishing Company Limited New Delhi; 1990.
6. Kanti Swarup, P.K.Gupta, Man Mohan; Operations Research; Sultan Chand & Sons Educational Publishers, New Delhi, 1977.
7. P.K.Gupta, D.S.Hira; Operations Research ; S.Chand & Company Ltd, New Delhi. 1979.
8. N.Paul Loomba; Linear Programming TMH Edition; Tata mcgraw-Hill Publishing Company Limited, New Delhi, 1971.

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS- 45 : 8051 Microcontroller

Course Outcomes:

At the end of this course, a student shall be able to:

- understand the basics of 8051 microcontroller
- explore the Programming and interfacing techniques of 8051
- apply knowledge of 8051 to design different application circuits
- acquainted with the basic concepts of advanced Microcontrollers

Total credits: 04 **Total lectures: 60**

Course content

1. Introduction to 8051 microprocessor [16]

Introduction to microcontrollers, difference between a microcontroller and microprocessor. Architecture of 8051:Block Diagram of 8051 and Study of Internal Blocks, Pin configuration of 8051,Reset and Clock, Registers, Flags and Internal Memory, SFRS, I/O Ports. Input/Output, Ports, internal memory, External memory.

2. 8051 Instruction Set [14]

Study of 8051 Instruction Set and Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives .Data transfer, Arithmetic, Logical, JUMP, Loops & CALL instructions, Bit manipulation Instructions.

3. Facilities in 8051 [18]

Programming 8051 timers, counter programming timer interrupts,

Timer and Counter: Timer and Counters, Timer modes, Programming for time delay in Mode 1 and Mode 2 using assembly and C. Introduction to interrupt ,Interrupt types and their vector addresses. Interrupt enable register and interrupt priority register(IE,IP), Synchronous and asynchronous serial communication , Programming serial port without interrupt, Use of timer to select baud rate for serial communication.

4. Interfacing: [12]

Interfacing ADC, DAC, LCD, stepper motor.

Recommended Books:

1. "The 8051 Microcontroller and Embedded systems using Assembly and C", by Rolin D.MckinlaySecond Edition. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. by Mckinlay.
2. "The 8051 Microcontroller Architecture, Programming & Application", K.Uma Rao and AndhePallavi, Pearson publications.
3. Programming and customizing the 8051 microcontroller by Myke Predko.
4. ARM System Developers guide: Sloss, Andrew n. Symes.
5. Design with PIC microcontrollers: Peatman, Pearson publications.

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS-46 : Analog Systems

Course Outcomes:

At the end of this course, a student shall be able to:

- understand basics of analog electronics
- experiment with different types of sensors
- work with different types of signal conditioning circuits
- apply knowledge of analog systems in different applications including ECG

Total credits: 04 **Total lectures: 60**

Course content

1. Measurments, Instrumentation And Calibration [6]

Measurements, Units, Standards Instrument, instrumentation, Calibration

2. Trancducers And Sensor [20]

Definition of sensors and transducers. Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensors (LM-35 and AD590), pH sensor, piezoelectric humidity sensor, optical sensor (LDR), displacement sensor (LVDT), Passive Infrared sensor (PIR), tilt sensor, touch sensor, ultrasonic sensor

3. Signal Conditioning [20]

Principles of signal conditioning, Signal conditioning of passive sensors using bridge circuit:Wheatstone 's bridge, Level Shifter, Amplifier, Three OP-amp instrumentation amplifier, Filters;active and passive filters. Working principle of Single order Op-Ampbased Low Pass Filter, High Pass Filter, Band Pass Filter, Notch Filter, Band reject filter;Working of Voltage to frequency Converter using OpAmp.

4. Case Study [14]

Temperature monitoring system using LM35, Water Level Indicator system using float switch, Electrocardiography (ECG).

Books Recommended

1. Electronic Instrumentation: H. S. Kalsi: TMH: 2nd Ed.
2. Modern Electronic Instrumentation and Measurement Techniques: Albert D.
3. Helfrick, William D. Cooper: PHI publications
4. Electronic measurements : K.A. Bakshi, A. V. Bakshi and U. A. Bakshi, Technical publications. A Course in Electrical and Electronic measurements and Instrumentation: A.K. Sawhney:
5. Dhanpat Rai & Sons Educational & technical publishers
6. Transducers & Instrumentation - Murthy PHI (Unit 1)
7. Instrumentation Measurements & Analysis- Nakra & Chaudhry TMH
8. Instrumentation Devices & Systems - Rangan, Sarma, Mani TMH
9. Sensors & Transducers : Dr. A. D. Shaligram: CTC publications
10. Op-Amps and Linear Integrated Circuits: Ramakant Gaikwad: PHI: 4th Ed.

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS PVII: Computer Science Practical - VII

Course outcomes:

At the end of this course, a student will be able to :

- explores stacks, queues, lists, vectors, hash tables, graphs, trees and algorithms including sorting, searching, iterating over data structures and recursion.
- design and construct simple object-oriented software with an appreciation for data abstraction and information hiding.
- effectively use software development tools including libraries to write and troubleshoot programs.

Total Credits 2

Course Content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .
40 marks: Practical work 30 marks and 10 marks for oral

PROGRAM LIST IN DATA STRUCTURES

1. Write a program in C++ to implement sorting algorithms like simple exchange sort, insertion sort and selection sort
2. Write a program in C++ to implement searching techniques like linear search and binary search.
3. Write a program in C++ to implement simple linear Stack with its basic operations like push(),POP()
4. Write a program in C++ to implement simple linear Queue and its operations.
5. Write a menu driven program that implements singly linked list for the following operations: Create, Display, add a new node, delete a node
6. Write a menu driven program that implements doubly linked list for the following operations: Create, Display, insert and delete
7. Write a program in C++ to implement insertion and deletion in B tree.
8. Write a menu driven program in C++ to
   a. Create a binary search tree
   b. Traverse the tree in Inorder, Preorder and Post Order
9. Write a program in C++ to implement binary search tree.
10. Write a program in C++ to implement simple linear Queue and its operations using linked list.
11. Write a program in C++ to implement stack and its operations using linked list.

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS PVIII: Computer Science Practical - VIII

Learning Outcomes:

At the end of this course, a student will be able to :

- understand the difference between desktop and dynamic web applications.
- understand the ASP.NET web application execution model.
- create and modify multi-page Web Form applications that involve and demonstrate features such as flow control, the use of style sheets, state management, data access, data binding, security, and data verification and validation.
- understand web application configuration and demonstrate the ability to manage basic configuration issues.

Total Credits 2

Course Content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

40 marks: Practical work 30 marks and 10 marks for oral

1. Write program to create ado.net connectivity using connected architecture. (using Connection, Data reader , command object) & display data in List box.
2. Write program to create ado.net connectivity using disconnected architecture.(using Connection ,Data Adapter ,Data dataset object) & display data in textboxes & navigate data. (first ,prev, next, last)
   Write ASP.NET program using ado.net for multiple table connection through wizard (textbox, list box)
3. Create crystal report .
4. Write ASP.NET program for exception handling. (Try-Catch)
5. Create WebApplication using Validation Controls
6. Create small WebServices
7. Create application using deployment.
8. Write program using ado.net to connect data grid .

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS EIV: Electronics Practical -IV

Course Outcomes:

At the end of this course, a student shall be able to:

- use basic concepts for building various applications in electronics.
- design procedures of different electronic circuits as per requirement.
- build experimental setup and test the circuits.
- explore the analyzing skills through the results of given experiments.

Total Credits 2

Course content

- Examination will be conducted on 8 experiments.

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B)Semester examination: 60 Marks in One session of 3 Hrs .

60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribution of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

(Note : Any 8 experiments should be performed)

1. Absolute decoding and linear select decoding.
2. Temperature to frequency / voltage converter
3. Reed relay control using digital logic
4. Build and test Amplitude Modulator and Demodulator.
5. Build and test Frequency Shift Keying.
6. Build and test TDM.
7. Study of pulse amplitude modulation.
8. Demonstration of working of Wi-fi card.
9. Demonstration Experiment on RFID application.
10. Build and test LDR based light control system.
11. Study of Linear Variable Differential Transformer.
12. Build and test Instrumentation Amplifier.
13. Study of radiation pattern of antenna.
14. 8051 Microcontroller programs: Arithmetic, logical & code conversion problems using assembly/C programming
15. Interfacing the thumbwheel & seven segment display.
16. Traffic light controller using microcontroller.
17. Interfacing LCD to Microcontroller.
18. To study waveform generator (square, triangular and saw tooth using DAC) with microcontroller
19. Study of radiation pattern of antenna.

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS-47 : Cloud Computing -II

Course Outcomes:

At the end of this course, a student shall be able to:

- explore the concept of virtulization in cloud computing
- understand and explore the security in cloud computing
- understand how to manage storage in cloud
- study the applications that uses cloud computing

Total credits: 04 **Total lectures: 60**

Course content

1. **Virtualization :** **(10)**
   Introduction, Characteristics of Virutalized environments, Taxonomy of Virtualization techniques, Pros and Cons of Virtualization.
2. **Storage in Cloud:** **(12)**
   Storage system architecture, Big data, Virtualize data centre(VDC) architecture,VDC Environment, storage, networking.
3. **Security in Cloud Computing :** **(12)**
   Introduction, Global Risk and Compliance aspects in cloud environments and key security terminologies, Technologies for Data security, Data security risk.
4. **Applications:** **(10)**
   Business applications, management applications, social applications, entertainment applications
5. **Cloud computing platforms:** **(6)**
   cloud platforms and challenges.
6. **Advance concepts in cloud computing:** **(10)**
   Basics and Vision, Applications and Requirements, Smart Devices and Services, Human Computer Interaction

Reference Books:

1. Cloud Computing: A Practical Approach for Learning and Implementation - Srinivasan
2. Cloud Computing : Rajiv Chopra, New Age International Publications
3. Cloud Computing Implementation, Mangement and Security: John W .Rittinghousa, CRC Press
4. Handbook on Cloud Computing, BorivojeFurht, Armando Escalante, Springer, 2010

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S.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester – IV

CS-48 : Data Warehousing and Data Mining- II

Course Outcomes:

At the end of this course, a student shall be able to:

- study and understand various algorithms used for data mining
- analyze the data using existing data mining tools
- apply operations like association , classification and clustering for a given dataset
- understand and implement clustering and and partitioning methods

Total credits: 04 **Total lectures: 60**

Course content

1.Data preprocessing **(12)**

Need, Objectives and techniques , Data cleaning ,integration ,transformation, reduction, discretization

2.Data mining concepts **(12)**

Data mining architecture , evolution of database technology , Types of data that can be mined ,functionalities, classification, major issues

3.Association rule mining **(12)**

Basic concepts, market basket analysis, road map, classification of association rule

4.Classification and prediction **(12)**

Classification concept , prediction, issues regarding classification and prediction, comparing classification methods, decision trees ,attribute selection measures

5.Cluster Analysis **(12)**

Introduction ,need ,clustering methods, types of data in cluster analysis ,partitioning methods, Cases, Case studies

Reference Books:

1. Data mining concepts and techniques - Jiawei Han and Micheline Kamber
2. Data Mining Data Warehousing- Nilesh magar, Vision Publication
3. Data Mining Techniques- Dr. Arun K. Pujari, Universal Press
4. Principles of Data Mining – Bramer, Springer

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS– 51 : System Programming

Course outcomes:

At the end of this course, a student shall be able to :

- organize the functionalities and components of a computer system into different layers, and have a good understanding of the role of system programming and the scope of duties and tasks of a system programmer.
- grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software).
- apply the knowledge and techniques learnt to develop solutions to real world problems.

Total credits: 04 **Total lectures: 60**

Course content

1. Introduction to operating system (4)
Simple monitor, buffering and spooling, I/O memory and CPU protection

2. Functions of operating system (6)
Services to the user-programs, System Call concept and interrupts

3. File systems (12)
Types of Files, Structure of a disk, block file operation. Allocation methods, Access methods, Directory structure

4. Scheduling concepts (12)
Scheduling algorithms First come First, Shortest Job First, preemptive algorithm with example

5. Memory Management (10)
Relocation, Swapping, Overlap swapping, Multiple partition and segmentation, Paging, Demand paging, page replacement algorithm

6. I/O scheduling (8)
First come first, Shortest-seeking-first, elevator algorithm. Comparison of algorithm

7. Resource allocation (8)
Deadlock prevention, Deadlock avoidance, Deadlock and recovery

Reference Books:

1. Operating System By Peterson
2. Operating System Concepts By Galvin, Silberschatz 8th Edition
3. Modern Operating System ,Andrew S. Tanenbaum, , Prentice Hall, 3rd Edition

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS- 52: Internet Technologies

Course outcomes:

At the end of the course, a student shall be able to :

- to understand the terms related to the Internet and how the Internet is changing theworld.
- to understand how computers are connected to the Internet and demonstrate the ability to use the World WideWeb.
- demonstrate an understanding of and the ability to use electronic mail and other internet basedservices
- understand the design principles of Web pages and how they arecreated
- develop an ability to create basic Webpages with HTML.

Total credits: 04 **Total lectures: 60**

Course content

1. Internet concept (10)

History & Need of Internet, Http & other protocols, Client/Server Concepts. Need for a common & Simple Language, Internet tools, Internet architecture and packet switching, Internet security,DNS Domain Name Representation

2. Introduction to HTML (10)

Basic Tags, HTML Attributes, Basic Layout, HTML Tag Reference, Document Structure Tags,Formatting Tags, Text Level formatting, List Tags, Hyperlink tags, Image and Image maps, Frame Tags, Executable content tags

3 Style Sheets (10)

Introduction to style sheets, Different approaches to style sheets, Linking to style information in s separate file, Using the <LINK>tag, embedded style information, Using <STYLE> tag, Inline style information.

4. Tables in HTML (10)

Tables Introduction to HTML tables and their structure, The table tags, Alignment, Aligning Entire Table, Alignment within a row, Alignment within a cell, Attributes, Background color, Adding a Caption, Setting the width, Adding a border, Spacing within a cell, Spacing between the cells, spanning multiple rows or columns, Elements that can be placed in a table.

5. Forms: (8)

Creating Forms, The <FORM> tag, Input fields, The <INPUT> tag, Multiple lines text windows, Text, Text Area, Password, Button, Submit, Reset, Radio, Checkbox, Select, Option, XML basics.

6. Java Script basics (6)

Script Basic, data types, operators, Statements ,comments, advantages.

7. Java Script control structures (6)

Break, comment, continue, while loop, for loop, if...else, return, switch, functions.

Reference Books

1. HTML 4 Unleashed (Second Edition) : Techmedia
2. The Complete Reference HTML : Tata McGRAW-HILL 3rd Edition
3. Begining Web Programming with HTML XML and CSS :JonDuckett

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS -53 : Theoretical Computer Science

Course Outcomes :

At the end of the course, a student shall be able to :

- understand and learn systems thinking, analyze, design them
- implement, and evaluate a computer-based system, process and component
- perform problem-solving efficiently
- explore communication of program to meet desired needs
- enhance teamwork and context awareness

Total credits: 04 **Total lectures: 60**

Course content

1. **Finite automata and regular expressions** **(15)**
   preliminaries, Finite State Machines, Non-deterministic Finite Automata (NFA)Finite Automata with $\in$ Mores, Regular Expressions, Regular Languages /Grammars, Finite Automata with output Definition of Moore and Melay Machine & Equivalence. Equivalence of Regular Expression and Finite Automata.
2. **Properties of Regular Sets** **(10)**
   Pumping Lemma for regular sets, Closure properties of regular. Minimizing Finite Automata, Myhill-Nercode Theorem.
3. **Context free Grammar** **(15)**
   Introduction, Types of Grammar, Regular Grammar, Equivalence of regular Grammar and Finite Automata, Derivation Trees, Ambiguity. Simplification of Context Free Grammars, Removing Useless Symbols and Productions, Chomsky Normal Form, Greibach Normal Form.
4. **Push Down Automata** **(10)**
   Informal Description and Definition. Equivalence of accepted by Final State and Empty state Equivalence of PDA and CFL.
5. **Introduction to Turing Machine** **(10)**
   Basic Turing Machine Model with Simple example for language recognition only.

Reference Books:

1. Introduction to Automata Theory. -Hapcraft, Ullman
2. Principles of compiler construction - Aho, Ulman,Sethi
3. Introduction To system software .By D.K Dhamdhere
4. System Programming By john Donovan

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS – 54: Programming in Java - I

Learning outcomes:

At the end of the course, a student shall be able to :

- Understand the knowledge of the structure and model of the Java programming language,
- use the Java programming language for various programming technologies
- develop software in the Java programming language
- evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements

Total credits: 04 **Total lectures: 60**

Course content

1. Introduction to Java (6)

Features of java, JDK Environment & tools like (java, javac, appletviewer, javadoc, jdb)

2 . Object Oriented Programming Concept (10)

Overview of Programming, Paradigm, Classes; Abstraction; Encapsulation; Inheritance; Polymorphism; Difference between C++ and JAVA

3. Java Programming Fundamental (10)

Structure of java program; Data types; Variables; Operators; Keywords; Naming Convention Decision Making (if, switch); Looping (for, while); Type Casting

4. Classes and Objects (12)

Creating Classes and objects; Memory allocation for objects; Constructor; Implementation of Inheritance; Simple; Multilevel; Hierarchical; Implementation of Polymorphism; Method Overloading; Method Overriding; Nested and Inner classes

5 Arrays String and Vector (10)

Arrays; Creating an array; Types of Array; One Dimensional arrays; Two Dimensional array Strings; String – Arrays ,String Methods, String Buffer class, Vectors; Wrapper classes

6. Abstract Class , Interface and Packages (10)

Modifiers and Access Control; Default, public private protected; Abstract classes and methods; Interfaces; Packages

7.Exception Handling (2)

Exception types; Using try catch and Multiple catch; Nested try; throw, throws and finally Creating User defined Exceptions

Reference Books :

1. Complete reference Java by Herbert Schildt(5^{th} edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS – 55 : Software Engineering

Course Outcomes:

At the end of the course, a student shall be able to :

- basic knowledge and understanding of the analysis and design of complex systems.
- ability to apply software engineering principles and techniques.
- produce efficient, reliable, robust and cost-effective softwaresolutions.
- ability to work as an effective member or leader of software engineeringteams.
- manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals
- identify and analyzes the common threats in each domain.

Total credits: 04 **Total lectures: 60**

Course content

1. **System Concept** **(06)**
   Definition, Elements of Systems, Types of System, System Boundary, Interface.
2. **Software Development Approaches**: Evolving Role of Software, Software Characteristics, Software Applications. **(04)**
3. **System Analysis** **(10)**
   Definition, Role of System Analyst, Requirement, Anticipation, Requirement Investigation, Requirement Specification, Feasibility Study, Fact Finding Methods Interview, Questionnaire, Record review / sampling, observation.
4. **Diagrammatic Representations** **(06)**
   Context level DFD's 1st& 2nd level DFD's , Functional Decomposition Diagram E-R Model, Study of Physical System Structure Chart
5. **Decision Tools** **(08)**
   Decision Tree, Decision Table, Structured English.
6. **System Design** **(08)**
   Normalization, Database Design.I/P Screen Design, O/P formal Design.
7. **System Development Life Cycle** **(10)**
   SDLC phases, Waterfall Model – Spiral Model, prototyping, incremental model.
8. **Data Dictionary** **(03)**
   Need of data dictionary, Example, Advantages of data dictionary, qualities of Good Software
9. **Introduction to Software Testing** **(05)**
   Testing concepts, Principles of software testing , verification and validation. Software Testing Fundamentals, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing.

Reference Books:

1. Analysis of Information Systems.- James Senn
2. Software Engineering.- Rojer Pressman
3. System Analysis and Design.- Elias Awad

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS PIX: Computer Science Practical –IX

Course Outcomes:

At the end of the course, a student shall be able to :

- develop systematic thinking to analyze, design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
- design and implement Simulator for assembly programs
- understand the interpretation of H/W using low level programs
- implement Macro preprocessor using C language

Total Credits: 2

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1. Line Editor
2. Writing Simulator for SMACO and SMACO programs
3. Writing Assembler
4. Interrupt Handler
5. Toy shell
6. MS- Dos patching
7. Writing simple macro –preprocessor

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS PX: Computer Science Practical –X

Course Outcomes:

At the end of the course, a student shall be able to:

- use knowledge of HTML and CSS code and an HTML editor to create personal and/or business websites .
- use critical thinking skills to design and create websites.
- gain knowledge of JavaScript applications development.

Total Credits : 2

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

Develop HTML document using following tags:

1. Heading, Body, Text formatting, Paragraph, Listing, Marquee tag
2. Link tags, Anchor, Image tags
3. Table tags
4. Form, Button, combo box, List box, Check box.
5. Developing web pages
6. Cascading Style sheets
7. Frame Layout
8. Audio and video tags
9. XML form
10. Java-script programs based on Control structures

11 Java-script programs based on Function

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS PXI: Computer Science Practical -XI

Course Outcomes:

At the end of the course, a student shall be able to :

- use concepts of object oriented programming concepts
- learn environment of jdk
- design java program using array and multiple inheritance
- implement exception handling using Java program

Total Credits: 2

Practical Examination

A A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1. Write a java program using control structures
2. Program on class and object creation
3. Method overloading
4. Program using single inheritance
5. Polymorphism
6. Program using array
7. Package
8. Interface
9. Exception Handling.

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS MI :Mini Project-I

Course Outcomes:

At the end of the course, a student shall be able to :

- apply of knowledge and techniques learnt in theoretical classes for developing the s/w for real problems.
- get an insight into the working of the real organizations/companies.
- gain deeper understanding in specific functional areas.
- explore career opportunities in their areas of interest.

Total Credits: 2

Guidelines for the Mini Project Formulation

The course Mini Project is one that involves requirement analysis, feasibility analysis, Database design, coding, testing, implementation and maintenance

Every student is required to carry out Mini Project work under the supervision of a Mentor.

The mentor shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work during the semester as per the schedule provided by the Coordinator.

Mini Project Synopsis Content

Mini Project proposal should be prepared in **consultation with the Mentor.** It should clearly state the objectives and environment of the proposed Mini Project to be undertaken. Ensure to include the following items while submitting your Mini Project synopsis.

Mini Project synopsis may contain required number of pages and sequence of contents should be in the following order:

1) Title of the Project
2) Synopsis Approval Performa
3) Index
4) Acknowledgement
5) Introduction and Objective of the Mini Project
6) Analysis (Feasibility Study, DFD 0 -Level, 1- Level and 2 Level/ER Diagram etc)
7) H/W and S/W Requirement
8) Table and Structure, Number of Modules, Detail of Modules, Data Structure
9) Types of Reports
10) Future Scope

Mini Project Report Formulation

The Mini Project may contain 70-100 pages (excluding coding) with double spacing. The project documentation must be with respect to the project only. Mini Project Report should follow the points given below:

1) Cover and Title page
2) Synopsis Approval Certificate/Company Certificate
3) Index
4) Acknowledgement
5) Certificate of Originality

6) Introduction/Aims and Objective
7) System Analysis
7.1 Identification of Need
7.2 Preliminary Investigation
8) Feasibility Study
8.1 Technical Feasibility
8.2 Economic Feasibility
8.3 Operational Feasibility
9) Analysis (Feasibility Study, DFD 0 Level, 1- Level and 2 Level/ER Diagram, and Data structure, Table structure etc).
10) S/W Engineering. Paradigm applied
11) S/W & H/W Requirement Specification
12) System Design
13) Screen Shots
14) Coding
15) Validation Checks
16) Implementation and Maintenance
17) Testing (Testing techniques and Testing strategies)
18) System Security measures
19) Various types of Reports/Modules
20) Pert Chart/Gantt Chart
21) Future scope of the Mini Project (452)
22) Bibliography/References/Glossary
23) Original Copy of the Approved Synopsis

The cover page must be hard bound in *Black Color; with Gold Embossing*.All the students are required to use either Arial / Times New Roman of font size 12throughout the report and in heading and subheadings font size shall be 14 .Two copies of the Mini Project report in bound form is to be prepared by the student(one for the college and one for himself/herself for future reference) All the copies must be duly signed by the in-charge faculty as per the schedule provided to you. One copy of the Mini Project Report must be retained by the student which should be produced before the examiner at the time of the Viva-voice.

The student must bring the soft copy of the projects as desired by the external examiner at the time of the viva voce.Each student is required to make a copy of Mini Project in CD and submit along with his/her Mini Project report.Mini Project can be developed in any language/ platform / package . Students can develop applications using tools/languages/Software which may be in use in their current organization where they may be undertaking the Mini Project(not mandatory)

Mini Project Evaluation

As per the University norms Mini Project Report shall be evaluated by the examiner at the end of the semester. However there will be continuous monitoring of the Mini Project progress report during the semester and distribution of marks shall be as follows:

Mini Project Evaluation Scheme

Mid Sem.Presentation : 40
End Sem Presentation Viva Project Evaluation: 60

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS – 56 : Data Communication and Networking- I

Course Outcomes:

At the end of the course, a student shall be able to :

- get familiar with the basics of computer networks
- understand network architecture and use of various protocols
- explore hardware connectivity, signaling, addressing, network topologies
- learn network design, switching, management
- security and standards with emphasis on the TCP/IP protocol suite

Total credits: 04 **Total lectures: 60**

Course content

1. **Introduction to Networks and Networking Concepts : (15)**
   Networking fundamentals; Needs of Networking; Local and wide Area Networks; Advantages and disadvantages; A Networking Lexicon; Clients, peers and Servers; The Network Medium Carriers; Network protocols; Network Software; Network Services; Network Types; peer-to-peer networking; Server-based Networking; Storage-area Networking; Hybrid Networks; Hardware requirements; Selecting the right Type of Network; Basics of Communication Networks; Point-to-point and Multidrop circuits; The telephone Network; Switched and non-switched options in communication; Connection oriented and connectionless networks
2. **Networking Medium (15)**
   Network Cabling: (Tangible physical media); General Cable characteristics; Base band and Broadband Transmission; The importance of Bandwidth; Co-axial, Twisted-pair, Fiber-optic Cable, UTP; Wireless Networking: (Intangible Media); Types of wireless networks; Wireless LAN application; Wireless LAN Transmission; Wireless Extended LAN Technologies; Microwave Networking Technologies; High-speed wireless Networking Technologies
3. **Network Architecture (15)**
   OSI and 802 Networking models; Role of Reference Model; OS1 Network Reference model; IEEE 802 Networking Specifications; Ethernet; Overview of Ethernet; 10/100 Mbps IEEE Standards; Gigabit Ethernet; Frame Types Ethernet; Segmentation ConceptToken Ring; Token Ring fundamentals; Hardware components; Structure of Token RingApple talk and ARCnet; FDDI; Boradband Technologies; Broadcast Technologies; ATM and SONET Concepts
3. **Networking devices (15)**
   Network Interface Grids (NIC); Basics of NIC and operation; Principles of NIC Configuration; Special purpose NIC, Wireless adapters and Remote Boot adapters; Device Driver Software; Equipment Perspective; Repeater ,Bridge ,Router ,Gateways; Protocol Specific Devices; Router Technology , Multiplexer; Network Switches

Reference Books:-

1. Computer Networks by Uyless Black.
2. Computer Communication and Networking Technologies by Michael A Gallop
3. Networking Essential, BPB Publication
4. Introduction to Networking by Barry Nance, PHI publication.
5. Computer Networks Andrew S Tanenbaum
6. Data & Computer Communication William Stallings.

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS -57: Data Analytics –I

Course Outcomes:

At the end of the course, a student shall be able to :

- implement statistical analysis techniques for solving practical problems
- perform statistical analysis on variety of data
- learn and implement the concepts of machine learning
- apply the techniques of Supervised Learning with Regression and Classification

Total credits: 04 **Total lectures: 60**

Course content

Prerequisite: This course requires that you are familiar with high-school level linear algebra, and calculus. Knowledge of probability theory, statistics, and programming is desirable.

1.Introduction: (10)

Data Definitions and Analysis Techniques: Elements, Variables, and Data Categorization, Levels of Measurement, Data Management and Indexing

2. Descriptive Statistics (10)

Introduction to the course Descriptive Statistics Probability Distributions, Measures of Central Tendency, Measures of Location of Dispersions, Error Estimation and Presentation (Standard Deviation, Variance), Introduction to Probability

3.Inferential Statistics (10)

Inferential Statistics through hypothesis tests Permutation & Randomization Test

4.Regression& ANOVA (10)

Regression ANOVA(Analysis of Variance)

5. Machine Learning: Introduction and Concepts (10)

Differentiating algorithmic and model based frameworks
Regression : Ordinary Least Squares, Ridge Regression, Lasso Regression,
K Nearest Neighbours Regression & Classification

6. Supervised Learning with Regression and Classification techniques -I (10)

Bias-Variance Dichotomy
Model Validation Approaches
Logistic Regression
Linear Discriminant Analysis
Quadratic Discriminant Analysis

Reference Books:

1.Hastie, Trevor, et al.The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
2.Montgomery, Douglas C., and George C. Runger.Applied statistics and probability for engineers. John Wiley & Sons, 2010

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

CS – 58 : Research in Computer Science -I

Course Outcomes:

At the end of the course, a student shall be able to :

- To familiar with the basics of Concepts of research
- Gain knowledge of different terms used in research.
- Implement and know the methods of research and data collection methods.

Total credits: 04 **Total lectures: 60**

Course content

1. **Basic Concepts of Research (14)**
   Definitions of research, nature and scope of research, characteristics of good research, types of research, qualities of good researcher, basic and applied research.
2. **Preparation for Research (16)**
   Preparing bibliography for background reading, formulating the research problem, survey of relevant literature, developing hypothesis and defining aims and objectives, deciding the scope and limitations of research, adopting appropriate research methodology, writing a research proposal
3. **Methods of Research (13)**
   Different methods of research, research methods and research methodology, experimental research, types of experiments
4. **Data Collection (17)**
   Primary and secondary sources of data, Primary: Observation, Interview, Questionnaire, Secondary: Internal and External, Collecting and Classifying Data Editing and analyzing the Data, Arriving at Interpretations and Generalizations

References

1. Michael P. Marder, Research Methods for Science, Cambridge University Press, 20111.
2. Research Methodology and project work by Dr. P.M. Herekar ,PhadkePrakashan
3. Research Methodology: Methods and Techniques by New age International Publishers, Third edition.

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester –V

UG AECC-51: Soft Skills

Course Outcomes

At the end of this course, Students will be able to

- communicate with others effectively
- exhibit qualities of leadership
- take responsibility to undertake a work and complete it.
- work in groups either as members or leaders
- think critically or laterally and solve problems
- be flexible to the needs of others
- negotiate with others to solve problems (conflict resolution)
- cope with pressure and yet produce results

Total credits: 02 **Total lectures: 30**

Course content

1. **Introduction to Soft Skills: (5)**
   Definition of soft skills; Need for soft skills; Nature and scope of soft skills; Acquiring soft skills; Advantages of soft skills
2. **Communication Skills: (5)**
   Types of Communication; Forms (Modes) of communication; Spoken communication; Written communication; Non-verbal communication; Barriers to communication; Linguistic skills; Listening, speaking, reading and writing (LSRW); Body language
3. **Soft Skills (5)**
   Critical, creative and positive thinking; Leadership, assertiveness and negotiation skills; Stress management and time management; Self-management; Building relationship skills; Problem-solving skills; Effective teamwork skills
4. **Personality Development (5)**
   Meaning of personality; Role of biological and social factors in forming personality; Personality traits; Motivation, awareness, creativity, punctuality; Teaching personality development
5. **Values (5)**
   Meaning of values; Importance of values; Kinds of values; Concept of mortality, character, duty and virtue; How to cultivate values
6. **Attitude (5)**
   Positive attitude; Negative attitude; Neutral attitude; Other attitudes; Formation of attitude; Components of attitude: emotional, behavioural, cognitive; Functions of attitude

Prescribed Textbook:

Tengse, Ajay R. *Soft Skills: A textbook for Undergraduate*, Hyderabad: Orient Black Swan

Reference Books

1. Covey Sean, *Seven Habits of Highly Effective Teens*, New York, Fireside Publishers, 1998.
2. Carnegie Dale, *How to win Friends and Influence People*, New York: Simon & Schuster, 1998.
3. Daniel Coleman, *Emotional Intelligence*, Bantam Book, 2006
4. Fredrick H. Wentz, *Soft skills Training – A workbook to develop skills for employment*
5. Barun K. Mitra*Personality Development and Soft skills*, Oxford University Press

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS -61 : Linux Programming

Course Outcomes:

At the end of the course, a student shall be able to :

- understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.
- Explore the design issues associated with operating systems.
- understand issues related to file system interface and implementation.
- understand and identify potential threats to operating systems and the security features design to guard against them.
- work on various types of operating systems including Linux.

Total credits: 04 **Total lectures: 60**

Course content

Unit 1. **(4)**

Operating system , Types of operating system , Functions of operating system , History and development of Linux , Features of Linux , Concept of shell , kernel , Kernel-shell relationship

Unit 2. **(12)**

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities.Sed-Scripts, Operation, Addresses, Commands, awk-Execution, Fields and Records,Scripts, Operation, Patterns, Actions, Associative Arrays, String and Mathematical functions, System commands in awk, Applications.

Shell programming with Bourne again shell(bash)- Introduction, shell responsibilities, pipes and Redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts

Unit 3. **(8)**

Files and Directories- File Concept, File types, File System Structure, file metadata-Inodes, kernel support for files, system calls for file I/O operations- open, create, read, write, close, lseek, dup2, file status information-stat family, file and record locking- fcntl function, file permissions - chmod, fchmod, file ownership-chown, lchown, links-soft and hard links - symlink, link, unlink.Directories-Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory-getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions.

Unit 4. **(12)**

Process - Process concept, Layout of a C program image in main memory. Process environment-environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control - process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process, system call interface for process management-fork, vfork, exit, wait, waitpid, exec family, Process Groups, Sessions and Controlling Terminal, Differences between threads and processes.

Signals - Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

Unit 5. (12)

Shared Memory- Kernel support for shared memory, APIs for shared memory, shared memory example.Sockets- Introduction to Berkeley Sockets, IPC over a network, Client-Server model, Socket address structures (unix domain and Internet domain), Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs-Single Server-Client connection, Multiple simultaneous clients, Socket options-setsockopt and fcntl system calls, Comparison of IPC mechanisms.

Unit 6. (12)

Interprocess Communication - Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pies-creation, IPC between related processes using unnamed pipes, FIFOs- creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions .Message Queues- Kernel support for messages, APIs for message queues, client/server example.Semaphores-Kernel support for semaphores, APIs for semaphores, file locking with semaphores.

TEXT BOOKS:

1. Unix System Programming using C++, T. Chan, PHI.
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
3. Unix Network Programming, W. R. Stevens, PHI.

REFERENCE BOOKS:

1. Beginning Linux Programming, 4th Edition, N. Mathew, R. Stones, Wrox, Wiley India Edition.
2. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson.
3. SystemProgramming with C andUnix, A. Hoover, Pearson.
4. Unix System Programming, Communication, Concurrency and Threads, K. A. Robbins, Pearson Education.
5. Unix shell Programming, S. G. Kochan and P. Wood, 3rd edition, Pearson Education.
6. Shell Scripting, S. Parker, Wiley India Pvt. Ltd.
7. Advanced Programming in the unixEnvironment, 2nd edition, W. R. Stevens and S. A. Rago, Pearson Education.
8. Unix and Shell Programming, B. A. Forouzan and R. F. Gilberg, Cengage Learning.
9. Linux System Programming, Robert Love, O'Reilly, SPD.
10. C Programming Language, Kernighan and Ritchie, PHI.

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS – 62: Internet Technologies-II

Course Outcomes:

At the end of the course, a student shall be able to :

- understand basics of the Internet and World WideWeb
- acquire knowledge and skills for creation of web site considering both client and server-sideprogramming
- learn basic skill to develop responsive webapplications
- understand different web services
- understand and implement concepts of PHP.
- learn application development using PHP.

Total credits: 04 **Total lectures: 60**

Course content

1. Introduction (08)

Open source concepts, features, applications, Execution of PHP, comments in php , client server architecture ,types of server, web browser, php advantages

2. PHP (10)

PHP Basic, Intro , Install, Syntax, Variables, constants, Operators, echo and print statement

3. Control Structures (10)

If statement, If...Else statement, nested if…else statement, Switch , While Loops ,for loop

3.Functions: (10)

Definition ,declaration ,types of functions, built-in functions and user defined functions String functions str_word_count, strrev, strops, str_replace, substr, substr_count, substr_replace, User defined functions

5.Arrays in PHP (08)

Definition ,declaration of an array, types of an arrays,PHP scripts on arrays.

6.Form and File System (08)

Form Designing, controls of form, operations on file, modes of file, error handling

7. Security and Case Studies (06)

Authentication, Authorization (Permissions), Encryption

Apache server, Linux, Mozilla (Firefox), Wikipedia, Open Office, Open Source Projects, Open source applications .

Reference Books :-

1. Programming PHP - Kevin tatore
2. Practical PHP programming – Huddson
3. Understanding Open Source Software Development – Joseph Feller and Brian Fitzgerald

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS – 63 : Compiler Construction

Course Outcomes:

At the end of the course, a student shall be able to :

- Understand, design and implement lexical analyzer
- design and implement parser
- Understand, design and code generation scheme

Total credits: 04 **Total lectures: 60**

Course content

Unit 1 **(10)**

Definition of Compiler, Aspects of compilation ,The structure of Compiler. Phases of Compiler – Lexical Analysis, Syntax Analysis, Semantic Analysis, Intermediate Code generation, code optimization, code generation. Error Handling ,Introduction to one pass &Multipass compilers, cross compiler, Bootstrapping.

Unit 2 **(10)**

Review of Finite automata as a lexical analyzer, Applications of Regular Expressions and Finite Automata (lexical analyzer, searching using RE), Input buffering, Recognition of tokens LEX: A Lexical analyzer generator (Simple Lex Program)

Unit 3 **(16)**

Definition , Types of Parsers, Top-Down Parser ,Top-Down Parsing with Backtracking: Method & Problems , Drawbacks of Top-Down parsing with backtracking, Elimination of Left Recursion(direct & indirect) Need for Left Factoring & examples , Recursive Descent Parsing : Definition ,Implementation of Recursive Descent Parser Using Recursive Procedures , Predictive [LL(1)]Parser(Definition, Model) , Bottom-Up Parsers , Operator Precedence Parser -Basic Concepts ,Operator Precedence Relations form Associativity & Precedence , Operator Precedence Grammar LR Parser Model Types [SLR(1), Canonical LR, LALR] Method & examples. YACC program sections, simple YACC program for expression

Unit 4 **(10)**

Syntax Directed Definition ,Syntax Directed Definitions(SDD) ,Inherited & Synthesized Attributes , Evaluating an SDD at the nodes of a Parse Tree, Example, Evaluation Orders for SDD's, Dependency Graph , Ordering the Evaluation of Attributes, S-Attributed Definition , L-Attributed Definition , Application of SDT , Construction of syntax trees

Unit 5 **(4)**

Memory Allocation, Memory allocation – static and dynamic memory allocation, Memory allocation in block structure languages, Array allocation and access.

Unit 6 **(10)**

Code Generation and Optimization Compilation of expression, Concepts of operand descriptors and register descriptors with example.Intermediate code for expressions – postfix notations, triples and quadruples, expression trees. Code Optimization – Optimizing transformations – compile time evaluation, elimination of common sub expressions, dead code elimination, frequency reduction, strength reduction

Reference Books:

1. Compilers: Principles, Techniques, and Tools ,Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman Principles of Compiler Design By : Alfred V. Aho, Jeffrey D. Ullman (Narosa Publication House)
2. LEX & YACC (O'reilly Publication)

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI
CS - 64: Programming in JAVA-II

Course Outcomes:
At the end of the course, a student shall be able to :

- understand files and perform operations on files
- analyze User Interface using Swing and AWT
- get familiar with threading concepts

Total credits: 04 **Total lectures: 60**

Course content

1. **Java input output** **(10)**
   File, Output stream, Reader reading text, writer, InputstreamReader, OutputstreamReader, CharacterStreamClasses, fileinputstream and fileoutputstream
2. **Applet Programming** **(10)**
   Types of applet, Applet Life cycle, Creating applet, Applet tag, Graphics class ,paint methods, drawing shapes
3. **AWT and Event Handling** **(10)**
   Components used in AWT, AWT controls
4. **Layout managers** **(10)**
   flow layout, border layout, Grid layout, Listeners types, Adapter classes
5. **Introduction to Swing** **(10)**
   Swing controls, JLabel, JTable, JTextField, JTextArea, JCheckbox, JComboBox, JTable,Component and container Event handling in swing,
6. **MultiThreading** **(10)**
   Threading basics, Life cycle of thread ,Creating Threads ,Priorities and Synchronization ,Inter Thread Communication ,Runnable Interface

Reference Books :

1. Complete reference Java by Herbert Schildt(5^{th} edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS- 65 : Unified Modeling Language

Course Outcomes:

At the end of the course, a student shall be able to :

- analyze and model software specifications.
- abstract object-based views for generic software systems.
- deliver software components using UML approaches

Total credits: 04 **Total lectures: 60**

Course content

1. **Object Modeling** **(12)**
   Characteristics of objects, Object oriented development object oriented Themes, Use of OOD, object and Classes links and association, Generalization, Inheritance Grouping Constructs, Aggregation, Abstract Class, Multiple Inheritance, Restriction.
2. **Dynamic Modeling** **(08)**
   Events and States, Operations, Nested State Diagrams.
3. **Design Methodology** **(08)**
   Steps in Analysis & Design, Decomposition of System
4. **Introduction to UML** **(08)**
   Overview of the UML, Conceptual Model of UML Architecture.
5. **Basic Structural Modeling** **(08)**
   Classes, Relationships, Common Mechanism, Class Diagrams Object Diagram.
6. **Basic Behavioral Modeling** **(08)**
   Interactions, Use Cases, Use CASE Diagram, Interaction Diagrams, Activity Diagrams.
7. **Architectural Modeling** **(08)**
   Components, Component Diagram, Deployment Diagram

Reference Books:

1. Object Oriented Analysis.- James Rambaugh
2. The Unified Modeling Language User Guide.- Goody Booch, James Rambaugh
3. UML in a Nut Shell.- Orelly

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS PXII: Computer Science Practical –XII

Course Outcomes:

At the end of the course, a student shall be able to :

- use shell commands and understand the purpose.
- write and execute shell scripts for performing various operations
- understand and execute awk programming

Total Credits:2

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1. Simple Unix Commands – date ,ls, mv, cp, cd, bc etc.
2. File commands : create ,copy, delete etc.
3. Filtering Commands- sed, tr etc.
4. Shell Scripts- Use of if statements, case etc.
5. Shell Scripts- loop statements etc.
6. Grep commands
7. Head, tail,sort commands
8. Shell Scripts- Use of multiple options, passing arguments to shell
9. AWK programming

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS PXIII: Computer Science Practical -XIII

Course Outcomes:

At the end of the course, a student shall be able to :

- use HTML form elements that work with any server-side language.
- create a PHP web page that is unique to each visitor.
- validate user input.
- create, back up and restore a MySQL database.
- perform various MySQL database queries

Total Credits:2

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1.Basic tags of PHP

2.PHP programs based on operators

3. Programming on decision making statements

4. Programming on looping

5. Programming on functions

6. Programming on strings

7. Programming on Array

8. Designing Forms

9. Files operations

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS PXIV: Computer Science Practical -XIV

Course Outcomes:

At the end of the course, a student shall be able to :

- use applet for internet programming
- create a swing to develop web page
- perform various layout Manager
- use multithreading concept

Total Credits:2

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

1. Applet
2. File handling
3. Graphics design
4. Awt controls
5. Grid layout
6. Flow layout
7. Swing controls
8. Applet
9. multithreading

*****

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS MII : Mini Project-II

Course Outcomes:

At the end of the course, a student shall be able to :

- apply knowledge and techniques learnt in theoretical classes for developing the s/w for real problems.
- get an insight into the working of the real organizations/companies.
- Gain deeper understanding in specific functional areas.
- explore career opportunities in their areas of interest.

Total Credits:2

Guidelines for the Mini Project Formulation

The course Mini Project is one that involves requirement analysis, feasibility analysis, Database design, coding, testing, implementation and maintenance. Every student is required to carry out Mini Project work under the supervision of a Mentor. The mentor shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work during the semester as per the schedule provided by the Coordinator.

Mini Project Synopsis Content

Mini Project proposal should be prepared in **consultation with the Mentor.** It should clearly state the objectives and environment of the proposed Mini Project to be undertaken. Ensure to include the following items while submitting your Mini Project synopsis.

Mini Project synopsis may contain required number of pages and sequence of contents should be in the following order:

1) Title of the Project
2) Synopsis Approval Performa
3) Index
4) Acknowledgement
5) Introduction and Objective of the Mini Project
6) Analysis (Feasibility Study, DFD 0 Level, 1- Level and 2 Level/ER Diagram etc)
7) H/W and S/W Requirement
8) Table and Structure, Number of Modules, Detail of Modules, Data Structure
9) Types of Reports
10) Future Scope

Mini Project Report Formulation

The Mini Project may contain 70-100 pages (excluding coding) with double spacing.

The project documentation must be with respect to the project only. Mini Project Report should follow the points given below:

1) Cover and Title page
2) Synopsis Approval Certificate/Company Certificate
3) Index
4) Acknowledgement
5) Certificate of Originality
6) Introduction/Aims and Objective
7) System Analysis

7.1 Identification of Need

7.2 Preliminary Investigation

8) Feasibility Study
8.1 Technical Feasibility
8.2 Economic Feasibility
8.3 Operational Feasibility
9) Analysis (Feasibility Study, DFD 0 Level, 1- Level and 2 Level/ER Diagram, and Data structure, Table structure etc).
10) S/W Engineering. Paradigm applied
11) S/W & H/W Requirement Specification
12) System Design
13) Screen Shots
14) Coding
15) Validation Checks
16) Implementation and Maintenance
17) Testing (Testing techniques and Testing strategies)
18) System Security measures
19) Various types of Reports/Modules
20) Pert Chart/Gantt Chart
21) Future scope of the Mini Project (452)
22) Bibliography/References/Glossary
23) Original Copy of the Approved Synopsis

The cover page must be hard bound in *Black Color; with Gold Embossing*.
All the students are required to use either Arial / Times New Roman of font size 12 throughout the report and in heading and subheadings font size shall be 14 .
Two copies of the Mini Project report in bound form is to be prepared by the student (one for the college and one for himself/herself for future reference)

All the copies must be duly signed by the in-charge faculty as per the schedule provided to you. One copy of the Mini Project Report must be retained by the student which should be produced before the examiner at the time of the Viva-voice. The student must bring the soft copy of the projects as desired by the external examiner at the time of the viva voce.
Each student is required to make a copy of Mini Project in CD and submit along with his/her Mini Project report.
Mini Project can be developed in any language/ platform / package . Students can develop applications using tools/languages/Software which may be in use in their current organization where they may be undertaking the Mini Project(not mandatory)

MINI PROJECT EVALUATION
As per the University norms Mini Project Report shall be evaluated by the examiner at the end of the semester. However there will be continuous monitoring of the Mini Project progress report during the semester and distribution of marks shall be as follows:

Mini Project Evaluation Scheme
Mid Sem.Presentation : 40
End Sem Presentation Viva Project Evaluation :60

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS- 66 : Data Communication and Networking-II

Course Outcomes:

At the end of the course, a student shall be able to :

- build an understanding of the fundamental concepts of computer networking.
- Get familiarize with the basic taxonomy and terminology of the computer networking area.
- Explore to the advanced networking concepts, preparing the student for entry to advanced courses in computer networking.

Total credits: 04 **Total lectures: 60**

Course content

Physical Layer (5)

Design issues, functionality, theoretical basis for public data communication, switched network, mobile telephone system

Data Link Layer (8)

Design issues,functionality, data link layer protocols, error correction and detection, elementary data link layer protocol, sliding window protocol

Network Layer (15)

Network Layer Design Issues, Routing Algorithms (Optimality principle, Static Routing Algorithms, Shortest Path, Flooding, Dynamic routing Algorithms, Distance Vector, Link State routing.), Congestion control Algorithms (Principles, Policies, Algorithms),Quality of Service (Requirements, Techniques, Integrated Services & Differentiated Services),Network Layer Protocols (IP Addressing , CIDR & NAT, IP layer protocols

Protocols and Tools (12)

Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Medium Access Control

(8) Motivation for a specialized MAC (Hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA, CDMA.

Network Security (12)

Cryptography, symmetric –key algorithms, public key algorithm, digital signatures, management of public keys, IPs,firewalls ,virtual private networks, wireless security,security issues and challenges in wireless network, authentication protocols, internet security and social media

References:

1. Behrouz and Forouzan - Introduction to Data Communication and Networking - 2nd Edition - TMH - 2001.
2. Jean Walrand Communication Networks (A first course) - Second Edition - WCB McGraw Hill - 1998.

******

T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS -67 : Data Analytics –II

Course Outcomes:

At the end of the course, a student shall be able to :

- implement statistical analysis techniques for solving practical problems
- perform statistical analysis on variety of data
- learn and work on Unsupervised Learning and Challenges for Big Data Analytics
- explore prescriptive analytics

Total credits: 04 **Total lectures: 60**

Course content

Prerequisite: This course requires that you are familiar with high-school level linear algebra, and calculus. Knowledge of probability theory, statistics, and programming is desirable.

1. Supervised Learning with Regression and Classification techniques -II (18)

Regression and Classification Trees
Support Vector Machines
Ensemble Methods: Random Forest
Neural Networks
Deep learning

2.Unsupervised Learning and Challenges for Big Data Analytics (22)

Clustering Associative Rule Mining
Association Rules Analysis
Decision Tree
Challenges for big data analytics

3.Prescriptive analytics (20)

Creating data for analytics through designed experiments
Creating data for analytics through Active learning
Creating data for analytics through Reinforcement learning

Reference Books:

1. Hastie, Trevor, et al.The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
2. Montgomery, Douglas C., and George C. Runger.Applied statistics and probability for engineers. John Wiley & Sons, 2010

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T.Y.B.Sc. (Computer Science) (CBCS 2018 Course) Semester-VI

CS – 68 : Research in Computer Science -II

Course Outcomes:

At the end of the course, a student shall be able to :

- acquire familiarity with the concepts and relevant to research in computer science
- gain knowledge of report writing
- design applications using ICT tools for research
- get an insight for plagiarism in research

Total credits: 04 **Total lectures: 60**

Course content

1. **Report writing** **(15)**
   Introduction and meaning, definitions, importance, precautions in report writing. Steps in report writing, structures and layout of research report. Requisites of a good research report and problems of research report. Plagiarism and its avoidance.
2. **Statistical methods for data analysis** **(15)**
   Types of data, Measures of Central Tendency and Dispersion,
   Correlation and Regression.
3. **ICT tools for research** **(30)**

a. Spreadsheet tool : Introduction to spreadsheet applications, features and functions, using formulae and functions, data storing, features for statistical data analysis, generating charts, graphs and other features(Tools: Microsoft Excel, Open Office and similar or other advanced tools)

b. Presentation tool: Introduction to presentation tools, features and functions, creating presentations, customizing presentation(Tools used: Microsoft Power point, Open Office or any other tool)

c. Web resources for research : Introduction to Internet, using search engines and advanced search tools.

References:

1. C. Radhakrishna Rao, Statistics and Truth, CSIR, 1989.
2. Sheldon M Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier, 2010. 4. Day RA, How To Write and Publish a Scientific Paper, Cambridge University Press, London, 1992.
3. Latour, B. and Woolgar., Laboratory Life: The Construction of Scientific Facts, 2 nd Edition, Princeton: Princeton University Press, 1986

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BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Science
B.Sc. - Computer Science
Old Syllabus

"Social Transformation Through Dinamic Education"

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE AND COMMERCE,

PUNE 411 038

Accredited with 'A+' Grade (2017) by NAAC
'A' Grade University Status by MHRD, Govt. of India
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC

BACHELOR OF COMPUTER SCIENCE (B.Sc.(CS)) PROGRAME

CBCS 2016 COURSE STRUCTURE

Under the Faculty of Science

TO BE IMPLEMENTED FROM ACADEMIC YEAR 2016-17

BHARATI VIDYAPEETH UNIVERSITY,

Bachelor of Computer Science B.Sc.(Computer Science)
(Choice Based Credit System)
Under: Faculty of Science
(To be implemented from 2016)

The B.Sc.(Computer Science) Degree Course is of three years duration divided into six semesters. The structure of the course and syllabus of the first year will come into effect from the academic year 2016-2017.The second and third year syllabus will be implemented from 2017-2018and 2018-2019 respectively.

Objectives : B.Sc(Computer Science) Course:

- To develop problem solving abilities using a computer
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To imbibe quality software development practices.
- To create awareness about process and product standards
- To train students in professional skills related to Software Industry.
- To prepare necessary knowledge base for research and development in Computer Science
- To help students build-up a successful career in Computer Science.

Learning Outcomes from the B.Sc (Computer Science)

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes.The programme provides sufficient breadth for the students to support a wide range of future careers and sufficient exposure to theoretical and fundamental issues to support lifelong learning in the discipline. The theme of the programme is one of designing and developing programmed solutions to problems, recognizing the complexity of interaction between people and systems. Practice is used as a way of exploring theory through its application.

RULES & REGULATIONS FOR B.Sc (COMPUTER SCIENCE) COURSE

1. <u>ELIGIBILITY FOR ADMISSION TO B.Sc(COMPUTER SCIENCE) COURSE :</u>

i. A candidate who has passed the Higher Secondary School Certificate Examination of the Maharashtra State Board or Higher Secondary Examination of its equivalent of any other statutory Board or University and has passed in English and in two Science subjects (i) Physics (ii) Mathematics shall be eligible for admission to the First year B.Sc (Computer Science) Degree course.

ii. Candidate who has passed H.S.C. examination (10+2) with English and any one of the following vocational subjects is also eligible for admission to the F.Y.B.Sc. (Computer Science) course.

Subject code	Subject
97	Information Technology
D9	Computer Science
C2	Electronics
J1/J2/J3	Electronics Technology
K1/K2/K3	Auto Engg. Technician
A1	Electrical Maintainance

iii. Also student who has completed Diploma course in Engineering (Polytechnic) Computer Science, Electronics and Information Technology or its equivalent examination recognized by MBTE, Mumbai or its equivalent of any other statutory Board or University.

Admission process:

- Admissions will be given as per the selection procedure/policies adopted by the college, in accordance with conditions laid down by Bharati Vidyapeeth University, Pune.
- Reservation and relaxation will be as per the Government rules and Bharati Vidyapeeth University, Pune.

2.INTAKE CAPACITY:

Intake capacity of the students for this course at the entry level will be 80 per year.

3. Course Structure of B.Sc.(Computer Science) Degree Programme and scheme of credits

Course Structure and Scheme of Credits :

Course	Semester	Credits	Total of Semester	Grant Total of the year
F.Y.B.Sc(Computer Science)	I	Theory (Core) - 24	32	62
		Practical – 06		
		Foundation - 02		
	II	Theory (Core) - 24	30	
		Practical – 06		
S.Y.B.Sc(Computer Science)	III	Theory (Core) - 24	36	70
		Practical – 06		
		Elective – 04		
		Foundation -02		
	IV	Theory (Core) – 24	34	
		Practical-06		
		Elective-04		
T.Y.B.Sc(Computer Science)	V	Theory (Core) -20	34	64
		Practical-06		
		Elective-04		
		Foundation-02		
		Mini Project -02		
	VI	Theory (Core) -20	32	
		Practical-06		
		Elective-04		
		Mini Project -02		
Grand Total of the Course (All Semesters)			**198 (192+6)**	**198**

F.Y.B.Sc(Computer Science): Semester I (From the Academic Year 2016-17)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -11	Introduction to RDBMS	03	03	03	40	60	100
	CS -12	Programming in C - I	03	03	03	40	60	100
	CS -13	Mathematical Foundation of Computer Science	03	03	03	40	60	100
	CS -14	Algebra -I	03	03	03	40	60	100
	CS -15	Principles of Analog Electronics - I	03	03	03	40	60	100
	CS-16	Principles of Digital Electronics -I	03	03	03	40	60	100
	CSI- LI	Lab Course on Oracle-I	04	02	03	40	60	100
	CSI- LII	Lab Course on C-I	04	02	03	40	60	100
	CSI- LIII	Lab Course on Electronics-I	04	02	03	40	60	100
Elective Courses	**Any Two from the following:**							
	CS -17	Computer Oriented Statistical Techniques -I	03	03	03	40	60	100
	CS-18	Compulsory English -I	03	03	03	40	60	100
	CS-19	Elementary Algoritmics	03	03	03	40	60	100
Foundation Course	**This paper is compulsory for all the students:**							
	UGF 12	Youth Development	02	02	02	20	30	50

F.Y.B.Sc(Computer Science): Semester II (From the Academic Year 2016-17)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -21	RDBMS using oracle	03	03	03	40	60	100
	CS -22	Programming in C - II.	03	03	03	40	60	100
	CS -23	Graph Theory	03	03	03	40	60	100
	CS -24	Algebra-II	03	03	03	40	60	100
	CS -25	Principles of Analog Electronics - II	03	03	03	40	60	100
	CS -26	Principles of Digital Electronics -II	03	03	03	40	60	100
	CSII- LI	Lab Course on Oracle-II	04	02	03	40	60	100
	CSII- LII	Lab Course on C-II	04	02	03	40	60	100
	CSII- LIII	Lab Course on Electronics-II	04	02	03	40	60	100
Elective Courses	**Any Two from the following:**							
	CS -27	Computer Oriented Statistical Techniques -II	03	03	03	40	60	100
	CS-28	Compulsory English -II	03	03	03	40	60	100
	CS-29	Operating Environment	03	03	03	40	60	100

S.Y.B.Sc(Computer Science): Semester III(From the Academic Year 2017-18)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -31	Object Oriented Programming with C++	04	04	03	40	60	100
	CS -32	Introduction to .Net using C#	04	04	03	40	60	100
	CS -33	Linear Algebra	04	04	03	40	60	100
	CS -34	Computer Oriented Numerical Methods	04	04	03	40	60	100
	CS -35	Digital systems and Microprocessors	04	04	03	40	60	100
	CS -36	Principles of Communication	04	04	03	40	60	100
	CSIII- LI	Lab Course on C++ and Data Structures -I	04	02	03	40	60	100
	CSIII- LII	Lab Course on .NET -I	04	02	03	40	60	100
	CSIII- LIII	Lab Course on Electronics -III	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -37	Cloud Computing -I	04	04	03	40	60	100
	CS -38	Data Warehousing and data mining-I	04	04	03	40	60	100
Foundation Course	**This paper is compulsory for all the students:**							
	UGF 32	Cyber Law	02	02	02	20	30	50

S.Y.B.Sc(Computer Science): Semester IV (From the Academic Year 2017-18)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -41	Data Structures using C++	04	04	03	40	60	100
	CS -42	ASP.Net	04	04	03	40	60	100
	CS -43	Computational Geometry	04	04	03	40	60	100
	CS -44	Optimization Techniques	04	04	03	40	60	100
	CS -45	8051 Microcontroller	04	04	03	40	60	100
	CS -46	Analog Systems	04	04	03	40	60	100
	CSIV-LI	Lab Course on C++ and Data Structures -II	04	02	03	40	60	100
	CSIV-LII	Lab Course on .NET -II	04	02	03	40	60	100
	CSIV-LIII	Lab Course on Electronics –IV	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -47	Cloud Computing -II	04	04	03	40	60	100
	CS -48	Data Warehousing and data mining-II	04	04	03	40	60	100

Environment Studies

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 50 lectures for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree marksheet. If any student fails in this course, the result of his/her degree course will be withheld by the university.

T.Y.B.Sc(Computer Science): Semester V (From the Academic Year 2018-19)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -51	Operating System	04	04	03	40	60	100
	CS -52	Web Supporting Technologies	04	04	03	40	60	100
	CS -53	Theoretical Computer Science	04	04	03	40	60	100
	CS -54	Core JAVA	04	04	03	40	60	100
	CS -55	Software Engineering	04	04	03	40	60	100
	CSV-LI	Lab Course on System programming and Linux -I	04	02	03	40	60	100
	CSV-LII	Lab Course on Web Supporting Technologies -I	04	02	03	40	60	100
	CSV-LIII	Lab Course on JAVA -I	04	02	03	40	60	100
	CSV-LIV	Mini Project -I	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -56	Data Communication and Networking -I	04	04	03	40	60	100
	CS -57	Management Information System -I	04	04	03	40	60	100
	CS -58	Research in Computer Science -I	04	04	03	40	60	100
Foundation Course	**This paper is compulsory for all the students:**							
	UGF 51	Soft Skills	02	02	02	20	30	50

T.Y.B.Sc(Computer Science): Semester VI (From the Academic Year 2018-19)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -61	Linux Programming	04	04	03	40	60	100
	CS -62	Open Source Technologies	04	04	03	40	60	100
	CS -63	Compiler Construction	04	04	03	40	60	100
	CS -64	Advance JAVA	04	04	03	40	60	100
	CS -65	Unified Modeling Language	04	04	03	40	60	100
	CSVI-LI	Lab Course on System programming and Linux -II	04	02	03	40	60	100
	CSVI-LII	Lab Course on Web Supporting Technologies -II	04	02	03	40	60	100
	CSVI-LIII	Lab Course on JAVA -II	04	02	03	40	60	100
	CSVI-LIV	Mini Project -II	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -56	Data Communication and Networking-II	04	04	03	40	60	100
	CS -57	Management Information System-II	04	04	03	40	60	100
	CS -58	Research in Computer Science -II	04	04	03	40	60	100

4. SCHEME OF TEACHING:

Class	Subjects/courses to be offered by student	No. of contact hours / week	Work Load / Week			
			Theory	Tutorial	Total	Practical
F.Y.B.Sc(Computer Science)	**12**	38	2	1	03	04
S.Y.B.Sc(Comput	**11**	42	3	1	04	04

er Science)						
T.Y.B.Sc(Computer Science)	**11**	42	3	1	04	04

5. MEDIUM OF INSTRUCTION:

The medium of instruction and examination shall be English.

6. CHANGE OF COURSE

As all the heads of the course are compulsory change of course is not allowed**.**

7. SCHEME OF EXAMINATION:

The Assessment of Regular students of Bachelor of Science (B.Sc.) course in the academic session 2016-17 and thereafter shall be based on

(a) University Examinations (UE),
(b) Internal Assessment (IA),
(c) Choice Based Credit System (CBCS), and
(d) Semester Grade Point Average (SGPA) and Cumulative Grade Point Average system (CGPA)

For each core and elective paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks. The Internal Assessment may be in the forms as follows:

a) Attendance 10 Marks
b) Home Assignment/Tutorial/Test/Presentation 15 Marks
c) Mid Semester Examination 15 Marks

Each practical examination for laboratory course is of 100 marks and three hour duration. The mini project included in the in Semesters V and VI will be evaluated for 100 marks for the allotted credits by a panel consisting of one internal and one external examiner .For both laboratory course and mini project , there will be internal assessment of 40 marks and the university examination of 60 marks.

A candidate shall be permitted to proceed further from the first semester upto Fourth Semester Irrespective of his/her failure in any of the semester Examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (Subsequent)semester subject. However he/she should have cleared all the papers at F.Y.B.Sc(Comp.sci)I and II when He/She gets admission to T.Y.B.Sc.(Comp.Sci) Sem V.

8. GRACING:

The gracing shall be done as per existing rules of the University.

9. VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

10. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
80 ≤ Marks ≤ 100	O	10
70 ≤ Marks < 80	A+	9
60 ≤ Marks < 70	A	8
55 ≤ Marks < 60	B+	7
50 ≤ Marks < 55	B	6
40 ≤ Marks < 50	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA

Formula to calculate Grade Points (GP)

Suppose that '*Max*' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set $x = Max / 10$ (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq$ Marks $\leq 10x$	10
$5.5x \leq$ Marks $< 8x$	Truncate (Marks/x) +2
$4x \leq$ Marks $< 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula SGPA=$\frac{\sum Ck \times GPk}{\sum Ck}$, where C_k is the credit-value assigned to a course and $GP_k$is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the formula CGPA=$\frac{\sum Ck \times GPk}{\sum Ck}$,where C_k is the credit-value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA) =	10 × CGPA – 10	if 5.00 ≤ CGPA ≤ 6.00
	5 × CGPA+ 20	if 6.00 ≤ CGPA ≤ 8.00
	10 × CGPA – 20	if 8.00 ≤ CGPA ≤ 9.00
	20 × CGPA – 110	if 9.00 ≤ CGPA ≤ 9.50
	40 × CGPA – 300	if 9.50 ≤ CGPA ≤ 10.00

<u>Award of Honours</u> :

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 ≤CGPA≤ 10.00	O	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤CGPA≤ 9.49	A+	Excellent	70 ≤ Marks < 80
8.00 ≤CGPA≤ 8.99	A	Very Good	60 ≤ Marks < 70
7.00 ≤CGPA≤ 7.99	B+	Good	55 ≤ Marks < 60
6.00 ≤CGPA≤ 6.99	B	Average	50 ≤ Marks < 55
5.00 ≤CGPA≤ 5.99	C	Satisfactory	40 ≤ Marks < 50
CGPA Below 5.00	F	Fail	Marks Below 40

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F.Y.B.Sc. (COMPUTER SCIENCE)

SEMESTER –I

CS- 11 : INTRODUCTION TO RDBMS

Course content **36 Lectures**

Objectives:

1. To introduce the fundamental concepts of RDBMS
2. To understand principles of databases
3. To learn database management operations
4. To learn client server architecture

Chapter 1 File Organization **[5]**

1.1 Introduction
1.2 Physical / logical files
1.3 Types of file organization
1.4 Choosing a file organization

Chapter 2 Introduction to RDBMS **[5]**

2.1Structure of Relational Databases (table, row, relation, Tuple)
2.2 keys in a relational database

Chapter 3 Database Architecture **[6]**

3.1 Data models (relational, hierarchical, network)
3.2 Data abstraction
3.3 Data independence
3.4 Classification of DBMS

Chapter 4 Conceptual Design (E-R model) **[8]**

4.1 Overview of DB design
4.2 ER data model (entities , attributes, entity sets, relations, relationship sets)
4.3 constraints (Key constraints, Mapping constraints, Strong & Weak entities, aggregation / generalization)
4.4 Conceptual design using ER modeling (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)
4.5 Case studies

Chapter 5 structure Query Language **[12]**

5.1 Introduction DDL (create, drop, alter), DML Statements(Insert, Update, Delete)
5.2 Forms of Basic SQL Query
5.3 union, intersection, nested queries
5.4 Aggregate Operator (group by, having), Aggregate functions

References

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan,
2. Database Management Systems ,Raghu Ramakrishnan,ISBN:9780071254342,

Mcgraw-hill higher Education
3. Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke ,McGraw-Hill Science/Engineering/Math; 3 edition, ISBN: 9780072465631
4. Database Systems, Shamkant B. Navathe, Ramez Elmasri

F.Y.B.Sc. (COMPUTER SCIENCE)

SEMESTER –I

CS-12 : PROGRAMMING IN C - I

Course content 36 Lectures

Objectives:

1. To develop problem solving abilities using structured programming language features using C.
2. To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
3. To imbibe quality software development practices.
4. To create awareness about process and product standards.

1. Introduction [6]

Introduction to problem solving, Program development process, algorithms, Flowchart , Introduction to programming languages (High level,low level , machine)compiler, interpreter, assembler, linker, loader.

2. Introduction to C language [8]

Structured programming concept, benefits of structured programming, History of C language, Importance of C, Basic Structure of C program, scope, features, objectives and application areas, writing and executing a C program, benefits of structured programming.

3. C fundamentals [8]

C character set, C tokens, keywords, identifiers**,** variables, constants, operators(arithmetic, relational, logical ,special and other), expressions, data types, statements, Managing I/O operations.

4. Control structures **[7]**

Introduction, Basic control structures (sequence, selection/decision making

Statement, Iterative statements, jump statements. etc.)

5. Functions **[7]**

Introduction, Standard functions, need for user defined functions , advantages of functions, how to write function, calling a function, Passing parameters, methods of passing arguments, recursion, storage Classes and its scope rules**.**

References

- Programming in C by S . Kohan
- Born to code in C by H. Schildt
- The art of C by H. Schildt
- C programming by Kerninghan & Richie by 2 nd edition
- Let us C by Yashwant Kanetkar
- C programming by E. Balaguruswami

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F.Y.B.Sc.(COMPUTER SCIENCE) MATHEMATICS

SEMESTER -I

CS-13 MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE.

Course content 36 Lectures

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in logic, lattices and Boolean algebra, recurrence relation and counting principles.

At the end of this course student are expected to be able to.

(i) know tautology, predicates and quantifiers.

(ii) draw Hasse diagrams, example of lattices and it's types.

(iii) use counting principles, applications of Pigeonhole principle, permutation and combination.

(iv) solve recurrence relation for finding total solution with the help of homogeneous solution and particular solution.

Unit 1: Logic [9]

1.1 Revision : Propositional Logic, Propositional Equivalences.

1.2 Predicates and Quantifiers : Predicate, *n*-Place Predicate or ,*n*-ary Predicate, Quantification and Quantifiers, Universal Quantifier, Existential Quantifier, Quantifiers with restricted domains, Logical Equivalences involving Quantifiers.

1.3 Rules of Inference : Argument in propositional Logic, Validity Argument(Direct and Indirect methods), Rules of Inference for Propositional Logic, Building Arguments.

Unit 2 : Lattices and Boolean Algebra [9]

2.1 Poset, Hasse diagram.

2.2 Lattice, Complemented lattice, Bounded lattice and Distributive lattice.

2.3 Boolean Functions : Introduction, Boolean variable, Boolean Function of degree n, **Boolean identities, Definition of Boolean Algebra**.

2.4 Representation of Boolean Functions : Minterm, Maxterm Disjunctive normal form, Conjunctive normal Form.

Unit 3 : Counting Principles [10]

3.1 Cardinality of a Set : finite set, countable and uncountable sets.

3.2 Basics of Counting : The Product Rule, The Sum Rule, The Inclusion-Exclusion Principle.

3.3 The Pigeonhole Principle: Statement, The Generalized Pigeonhole Principle, Its

Applications.

3.4 Generalized Permutations and Combinations : Permutation and Combination with Repetitions, Permutations with Indistinguishable Objects, Distributing objects into boxes : Distinguishable objects and distinguishable boxes, Indistinguishable objects and distinguishable boxes, Distinguishable objects and Indistinguishable boxes, Indistinguishable objects and Indistinguishable boxes

Unit 4 : Recurrence Relations [8]

4.1 Recurrence Relations : Introduction, Formation.

4.2 Linear Recurrence Relations with constant coefficients.

4.3 Homogeneous Solutions.

4.4 Particular Solutions.

4.5 Total Solutions.

Reference Books:

1) Kenneth Rosen, Discrete Mathematics and It's Applications (Tata McGraw Hill)
2) C. L. Liu ,Elements of Discrete Mathematics, (Tata McGraw Hill)
3) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakashan, 1998

F.Y.B.Sc.(COMPUTER SCIENCE) MATHEMATICS

SEMESTER-I

CS-14 ALGEBRA-I

Course content 36 Lectures

Objectives:

The main objective of this course is to introduce students to some basic concepts relations and functions, binary operations and groups, divisibility in intergers.

At the end of this course student are expected to be able to.

(1) study the sets, relations, and equivalence class, find transitive closure with the help of Warshall's algorithm, types of function.

(2) study the groups and various examples and types of groups.

(3) solve the examples on mathematical induction, to solve the examples with the help of Fermat's theorem.

Unit 1: Relations and functions [9]

(1.1) Ordered pairs, Cartesian product of Sets.

(1.2) Relations, types of relations, equivalence relations. Partial orderings.

(1.3) Equivalence Class, properties and partition of a set.

(1.4) Transitive closure and Warshall's Algorithm.

(1.5) Digraphs of relations, matrix representation and composition of relations.

(1.6) Definition of function as relation, types of functions (one-one, onto and bijective)

Unit 2: Divisibility in Integers [13]

(3.1) Well ordering principle

(3.2) First and second Principle of Mathematical Induction, Examples

(3.3) Division Algorithm (without proof)

(3.4) Divisibility and its properties, prime numbers.

(3.5) Definition G.C.D and L.C.M., Expressing G.C.D. of two integers as a linear combination of the two integers.

(3.6) Euclidean Algorithm (Without proof).

(3.7) Relatively prime integers, Euclid are Lemma and its generalization.

(3.8) Congruence relations and its properties, Residue Classes: Definition, Examples: (Z_n , +, X), Z_n is a field iff n is prime, addition and multiplication modulo n and composition tables

(3.9) Euler's and Fermat's Theorems. (Without proof).Examples

Unit 3: Coding Theory,Automata Theory and Languages,Group Codes [7]

(3.1) Coding of binary information and error detection
(3.2) Decoding and error correction
(3.3) Linear codes,parity check
(3.4) Generator matrix ,examples of coset leader

Unit 4: Complex Numbers [7]

(4.1) Revision: Addition, Subtraction, Multiplication, Conjugate, Division
(4.2) Modulus and Argument of Complex number, Geometric Representation
(4.3) Polar form and it's properties
(4.4) DeMoivre's theorem and it's applications
(4.5) Solution of equations by using DeMoivre's theorem

Text Books:

1) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakashan, 1998
2) Prof .Mrs. M.D.Bhopatkar, Prof. C.S.Nimkar, Prof .Mrs. S.Joglekar; Algebra; Vision Publications,1998.
3) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare; Algebra; Nirali Prakashan, 1998.

F.Y.B.Sc(COMPUTER SCIENCE)(ELECTRONICS)
SEMESTER I

CS-15 : Principles of Analog Electronics - I

Objectives:

1. To get familiar with basic circuit elements and passive components
2. To understand DC circuit theorems and their use in circuit analysis
3. To study characteristic features of semiconductor devices
4. To study elementary electronic circuits and applications
5. To understand basics of BJT, FET

Course content **36Lectures**

1. Introduction to components (6)

Resistors

Capacitors

Inductors and Transformers

Charging and discharging of capacitors

Growth and decay of current in L-R circuits

Growth and decay of voltage in C-R circuits

Simple numerical on the above

2. Network theorems (only statement and problems applied to DC (08)

Revision of Ohm's law & Kirchoff's laws

Thevenin's theorem

Norton's theorem

Maximum power transfer theorem

Superposition theorem

(numerical problems with
maximum two meshes)

3. Bipolar Junction Transistor (09)

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V Characteristics, parameters, specifications

BJT as an amplifier .Transitor amplifier configuarations - CB, CC and CE,

Transistor biasing, Q-point

DC load line for a CE amplifier

Transistor as a switch

Simple numerical problems on biasing and DC load line.

4. Amplifier (7)

Concept and definition of an amplifier

Classification based on frequency, coupling and operating point

Single stage RC coupled CE amplifier.

Frequency response and bandwidth of RC coupled amplifier .

5. JFET and MOSFET **(06)**

Working Principle of JFET and MOSFET

I/V Characteristics

Parameters

Application of JFET as a switch and as an amplifier.

Numerical problems.

comparison of JFET, MOSFET and BJT

Working principle of UJT and SCR

Application of UJT as relaxation Oscillator.

REFERENCE BOOKS

1. Integrated circuits by Milliman.
2. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
3. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition,
4. 2010
5. Electronic Principles:Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
6. Principals of Electronics: V.K. Mehta, S.Chand and Co.
7. A text book of electrical technology: B.L.Theraja, S.Chand and Co.

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F.Y.B.Sc. (COMPUTER SCIENCE) (ELECTRONICS)

SEMESTER I

CS- 16 : Principles of Digital Electronics -I

Objectives:

1. To get familiar with concepts of digital electronics
2. To learn number systems and their representation
3. To understand basic logic gates, Boolean algebra and K-maps
4. To study arithmetic circuits, combinational circuits and sequential circuits

Course Content **36 Lectures**

1.Number Systems And conversions (07)

Binary, Octal , Decimal, Hexadecimal number systems.

Inter conversions of number systems.

BCD, Excess-3 code,Gray codes and Hamming codes.

Error detection and correcting codes

Excess three code , One's and Two's compliment method

Examples

2.Logic gates And their Applications (08)

Revision of different logic gates.

Boolean algebra and a few identities

De-morgan's I^{st} and 2^{nd} theorem.

Interconversion of gates.

Rules of binary addition and subtraction, subtraction using 1's and 2's complements, Half adder, full adder, Half subtractor, Full subtractor, Four bit parallel adder, Universal adder / subtractor, Digital comparator

Introduction to logic families

TTL NAND gate, input output parameters, tristate logic

Fan-in fan-out, propogation delay, noise margin

3.Boolean Algebra and Karnaugh maps (09)

Boolean algebra rules and Boolean laws: Commutative, Associative, Distributive,

AND, OR and Inversion laws,

De Morgan's theorem, Universal gates.

Min terms, Max terms , Boolean expression in SOP and POS form,

conversion of SOP/POS expression to its standard SOP/POS form., Simplifications of Logic equations using Boolean algebra rules .

Introduction to Karnaugh's map.

Formation of Pair,Quad and Octet.

Significance of Karnaugh Map.

Simplification of 2,3 and 4 variables using K-Map

4.Multiplexers - Demultiplexers and Encoder –Decoder (12)

Introduction to multiplexers and Demultiplexers

2:1,Mux 4:1Mux, 8:1 Mux

Multiplexer Tree.

1:2Demux,1:4Demux,1:8Demux

Introduction to Encoders and decoders.

Decimal to BCD encoder

BCD to 7 Segment Decoder.

Study of IC 74147 and IC74138.

REFERENCE BOOKS:

1. Digital Electronics: Jain R.P., Tata McGraw Hill
2. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
3. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education

F.Y.B.Sc. (COMPUTER SCIENCE)
CSI –L I : LAB COURSE ON ORACLE-I

Objectives

1. To introduce the fundamental concepts of RDBMS
2. To learn SQL environment
3. To familiar with basic operations of SQL

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Create simple tables.
2. Create tables using various data constraints.
3. Create tables using existing tables.
4. Different forms of select statements
5. Queries using insert, delete statements.
6. Queries using Alter and Update statements.
7. Simple queries using functions & Set Operators.
8. Simple queries using mathematical functions and Date functions

NOTE: At least 8 assignments must be performed.

Note: An Industrial visit should be arranged and report should be submitted at the end of academic year.

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F.Y.B.Sc. (COMPUTER SCIENCE)

CSI –L II : LAB COURSE ON C-I

Objectives

1. To introduce the fundamental concepts of C
2. To learn C Programming Language
3. To learn basic structures in C programming Laguage

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Introduction to c programming environment.
2. Basic programs using c programming language including use of arthmatic operators, areas etc.
3. Program base on if statements,if---else and nested if else statements

4. Programs based on condition checking and Looping (e.g. inverting Number, checking whether number is prime, finding GCD and LCM etc.)

5. .Program based on switch case ,return and goto statements.

6. Program using Function

7. Program using recursion

NOTE : At least 8 assignments must be performed.

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F.Y.B.Sc. (COMPUTER SCIENCE)

CSI – LIII : LAB COURSE FOR ELECTRONICS -I

Objectives:

1. To use basic concepts for building various applications in electronics.
2. To understand design procedures of different electronic circuits as per requirement.
3. To build experimental setup and test the circuits.
4. To develop skills of analyzing test results of given experiments.
   - One activity equivalent to 2 experiments by the student.

a. Electronics project
b. Documentation type experiments
c. Presentation/Seminar on Electronics /advanced topic/research topics.

- ·□One activity equivalent to 2 experiments to be arranged by the teacher – Arrange atleast two practical demonstrations / Workshops /Industrial visit which will enhance quality and skills of the student.
- □Examination will be conducted on 8 experiments as well as on activities

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

List of Topics

1. Identification of circuit components.
2. Use of CRO signal generators , power supplies and multimeters.
3. CRO for frequency ,phase and amplitude measurements.
4. Verification of KCL,KVL, Thevenin's and Nortan's theorems.
5. Verification of maximum power transfer theorem.
6. Study of phase shift oscillator,Wein bridge oscillator.
7. Crystal Oscillator.
8. Study of potential divider biasing of BJT and its use in DC motor driving
9. Diode as half wave ,full wave and bridge rectifier.
10. OP-AMP applications as adder –subtractor.
11. OP-AMP applications integrator-differentiator
12. Study of output and transfer characteristics JFET/MOSFET
13. 5. Study of I-V characteristics of UJT and Demonstration of UJT based relaxation oscillator .

NOTE : At least 8 Practicals must be performed.

F.Y.B.Sc. (Computer Science)

Semester- I

CS - 17 : Computer Oriented Statistical Techniques –I

(CBCS 2016 Course)

Total Lectures:- 36

Objectives: The main objective of this course is to acquaint students with some basic concepts in Statistics and introduced some elementary statistical methods of analysis of data. At the end of this course students are expected to be able,

(i) to compute various measures of central tendency, dispersion, skewness and kurtosis.

(ii) to analyze data pertaining to attributes and to interpret the results.

(iii) to compute the correlation coefficient for bivariate data and interpret it.

(iv) to fit linear regression line to the bivariate data

Unit 1. Scope of Statistics and Data Condensation and Graphical Methods (08L)

1.1 Defination : Webseter's and Secrist's definition of Statistics
1.2 Importance of statistics
1.3 Scope of statistics : Industry, Goverment,. Computer science, social science,etc
1.4 Raw data, attributes and variables, discrete and continuous variables
1.5 General principles of classification of raw data
1.6 Construction of frequency distributionand cumulative frequency distribution, relative frequency distribution.
1.7 Graphical representation of frequency distribution : histogram,frequency polygon,frequency curve , ogive curve
1.8 Diagrammatic representation : simple bar, subdivided bar, pie diagram, use of MS-excel/ spreadsheet for domonstrating these diagram
1.9 Numerical problems

Unit 2.Measures of Central Tendency and Dispersion (11L)

2.1 Concept of central tendency
2.2 Criteria for good measures of central tendency
2.3 Arithmetic mean : definition for ungrouped and grouped data, combined mean, merits and demerits
2.4 Median: defination, formula for computation for ungrouped and grouped data, graphical methods, merits and demerits
2.5 Mode: definition, formual for computation for ungrouped and grouped data, merits and demerits
2.6 Use of appropriat average
2.7 Quartiles: defination, formulae for grouped data
2.8 Concept of dispersion and measures of dispersion
2.9 Absolute and relative measure of dispersion
2.10 Range: definition for ungrouped data, merits and demerits
2.11 Variance: definition for ungrouped and grouped data, combined Variance for two groups, merits and demerits
2.12 Standard deviation: definition for ungrouped and grouped data, Coefficient of variation
2.13 Numerical problems

Unit 3. Moments and Measures of Skewness and Kurtosis (08L)

3.1 Raw and central moments: definition, for ungrouped and grouped Data (only up to first 4 moments)
3.2 Relation between central and raw moments
3.3 Idea of symmetric frequency distribution, skewness of a frequency distribution, positive and negative skewness, empirical relation between mean, median and mode
3.4 Pearson's and Bowley's coefficients of skewness
3.5 Idea of kurtosis for a frequency distribution
3.6 Measures of skewness and kurtosis based on moments
3.7 Numerical problems

Unit 3. Correlation and Regression (for ungrouped data) (09L)

4.1 Bivariate data : scatter diagram
4.2 Concpt of correlation, positive correlation, negative correlation
4.3 Karl Pearson's cofficient of correlation (r)
4.4 Limits of r, $-1 \leq r \leq 1$, and interpretation of r
4.5 Concept of regression, cause and effect relation
4.6 Properties of regression coefficient : $b_{xy}\ b_{yx} = r^2$, $b_{xy}\ b_{yx} \leq 1$, $bxy = r\sigma_x/\sigma_y$, and $bxy = r\ \sigma_y/\sigma_x$
4.7 Numerical problems

Books Recommended

1) Hogg R. V. and Craig, R. G.
Introduction to Mathematical Statistics.
2) Hoel. P. G.
Introduction to Mathematical Statistics.
3) Feller. W
Introduction to probability Theory and it's Applications. Vol –I
4) Mood A. M., Grabill, F. A. Boes D. C.
Introduction to Theory of Statistics.
5) Meyar P. L.
Introduction to Probability and Statistical Applications.
6) Goon, Gupta and Das Gupta
Fundamentals of Statistics Vol I & II
7) S. P. Gupta
Statisticalmethods.

F.Y.B.Sc. (Computer Science)

Semester- I

CS18: Compulsory English - I (To be implemented from June 2016)

Course Content **36 Lectures**

A. Objectives:

a) To encourage and enable the students to read the various types of texts on their own and discuss them among peers.
b) To develop competence among the students for self-learning.
c) To develop their communicative skills and their proficiency in English language.
d) To make students aware of the different communicative skills.
e) To prepare them to function effectively in their future professions.

Prescribed Text: ***Views & Visions: An English Coursebook for Undergraduates*** *by* Orient BlackSwan

Prose:

1. Towards Universal Brotherhood *Rashtrasant Tukdoji Maharaj*
2. Buddha, 'The Enlightened One' *Max Eastman*
3. How Wealth Accumulates and Men Decay *George Bernard Shaw*
4. The Romance of a Busy Broker *O. Henry*
5. Kalpana Chawla Anonymous

Poetry:

1. Where the Mind is Without Fear *Rabindranath Tagor*
2. A Psalm of Life *H.W. Longfellow*
3. Mirror *Sylvia Plath*
4. Lord Ullin's Daughter *Thomas Cambell*
5. Curious Mishaps *Vikram Seth*

Grammar, Usage and Composition:

1. Articles 2. Prepositions 3. Tense
4. Kinds of Sentences 5. Transformation of Sentences

(Note: All the units as covered in the prescribed text

F.Y.B.Sc. (COMPUTER SCIENCE)

SEMESTER –I

CS- 19 : ELEMENTARY ALGORITHMICS

Course content **36 Lectures**

Objectives:

- Analyze the performance of algorithms.
- To develop Analytical / Logical Thinking and Problem Solving capabilities
- Apply important algorithmic design paradigms and methods of analysis.

1. Concepts of Problem, Procedure and Algorithm, Algorithm Representation through Pseudo-Code and Flow-Charts Tracing of Algorithms. Concept of a program and structure of procedure oriented languages. [6]

2. Problem Analysis and Design of Algorithms for problems such as (1) Swapping(2) Counting (3) Finding the Sum, Product, maximum, minimum of a list of numbers, and (4) Simple variations of the above problems realization that there may be alternative algorithm and that one algorithm may be better (in some sense)than the other. [7]

3. Problem Analysis and Design of Algorithms for problems such as (1) Evaluation of a polynomial (2) Sum of first n factorials (3) Finding the n^{th} term of a Fibonacci sequence, (4) Finding the largest and second largest of a list, (5) Evaluating finite series and variations of these problems, (6) Determining n^{th} root of a number [7]

4. Introduction to recursive algorithms and their tracing. Applications to (1) Computation of a factorial, sum, maximum, Fibonacci terms . (2) Base conversion (3) Reversing a String and checking for palindrome property. (4) To compute GCD . [5]

5. Concept of array and problems that involve array manipulation (1) Removing the duplicates (2) Partitioning of an array, (3) Listing of prime numbers (4) Finding the prime factor of a number (5) Printing a Histogram. [5]

6 . The problem of search and merge, Linear, Binary search algorithms. The problem of Sorting, Selection, Insertion, Bubble, Quick, and Merge Sort algorithms. [6]

Reference Books :

1. How to solve it by a computer by Dromey R.G.
2. Data Structures, Algorithms and applications in C++ (Ch I I) by Sartaj Sahni

F.Y.B.Sc. (COMPUTER SCIENCE)

SEMESTER-II

CS-21 : RDBMS USING ORACLE

Course content **36 Lectures**

Objectives:

1. To teach database management operations
2. To teach data security and its importance
3. To teach client server architecture
4. To Understand Concepts of Data Normalization

Chapter 1 : Transaction Concepts [12]

Describe a transaction, properties of transaction, state of the transaction., Executing transactions concurrently associated problem in concurrent execution, Schedules, types of schedules, concept of serializability, precedence graph for Serializability, Ensuring Serializability by locks, different lock modes, 2PL and its variations, Basic timestamp method for concurrency, Thomas Write Rule, Locks with multiple granularity, dynamic database concurrency (Phantom Problem), Timestamps versus locking, Deadlock handling methods, Detection and Recovery (Wait for graph).Prevention algorithms (Wound-wait, Wait-die)

Chapter 2 : Relational algebra [5]

Preliminaries, Relational algebra (selection, projection, set operations, renaming joins, division

Chapter 3 : Relational Database Design [5]

Dependencies : Functional, transitive , multi –valued , Normalization : First ,Second ,Third normal form, Desirable properties of decomposition(lossless -join , dependency preservation)

Chapter 4: PL/SQL [7]

Introduction, Syntax, Datatypes, Variables, Control Structure(Conditional & Iterative),block structure

Chapter 5 : Stored Procedure & Triggers [7]

Creating Procedure(Declarative Part, Executable Part), Syntax Applications ,Using Procedures, Advantages, functions, Use of database triggers ,Types of triggers, Working of Triggers

References

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudarshan, ISBN:9780071289597,Tata McGraw-Hill Education

2. Database Management Systems ,Raghu Ramakrishnan,ISBN:9780071254342,

Mcgraw-hill higher Education.
3. Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill Science/Engineering/Math; 3 edition, ISBN: 9780072465631
4. Database Systems, Shamkant B. Navathe, Ramez Elmasri,ISBN:9780132144988, PEARSON HIGHER EDUCATION
5. Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones,Neil Matthew, ISBN:9781590594780, Apress
6. PostgreSQL, Korry Douglas, ISBN:9780672327568, Sams
7. Practical PostgreSQL (B/CD),John Worsley, Joshua Drake, ISBN:9788173663925 Shroff/O'reilly
8. Practical Postgresql , By Joshua D. Drake, John C Worsley **(O'Reilly publications)**
9**.** "An introduction to Database systems", Bipin C Desai, Galgotia Publications
10.Commercial Application Development Using ORACLE DEVELOPER 2000,BPB PUBLICATIONS By IVAN BAYROSS

F.Y.B.SC. (COMPUTER SCIENCE)

SEMESTER II

CS-22 : PROGRAMMING IN C-II

Course content **36 Lectures**

Objectives:

1. To train students in professional skills related to Software Industry.
2. To prepare necessary knowledge base for research and development in Computer Science.
3. To help students build-up a successful career in Computer Science using foundation of C language.

1. Arrays [12]

Declaration, entering data into an array, reading data from an array, one dimensional arrays, two dimensional arrays, multi dimensional arrays, arrays and functions, character strings, declaring and initializing string variables, standard library functions, arrays of strings.

2. Structures and Unions [8]

Declaration of structures, initialization of structures, nested structures, Arrays of structures, Declaration of union, initialization of union, differentiate between structures and union.

3. Pointers [8]

Introduction to pointers, pointer declaration ,uses of pointers, applications of pointers, pointer arithmetic, pointer to pointer, pointer to constant object, pointers and arrays, pointers to functions ,pointers to structures.

4 File handling [8]

Introduction, streams, types of files, operations on file standard input-output functions, formatted input-output functions.

References

- Programming in C by S . Kohan
- Born to code in C by H Schildt
- The art of C by H Schildt
- C programming by Kerninghan & Richie – 2 nd edition
- Let us C by Yashwant Kanetkar
- C programming by E- Balaguruswami

F.Y.B.Sc.(COMPUTER SCIENCE) MATHEMATICS

SEMESTER-II

CS-23 GRAPH THEORY

Course content 36 Lectures

Objectives:

The main objective of this course is to introduce students to some basic concepts in Graphs, operations on graphs, Connected Graphs, Eulerian and Hamiltonion graphs, Trees, Directed Graphs. At the end of this course student are expected to be able to.

(1) find adjacency and incidence matrix of graphs.

(2) studied various types operations on graph.

(3) find shortest path of graph using Dijkstra's Algorithm.

(4) introduce the Chinese Postman Problem and Travelling Salesman Problem.

(5) find shortest spanning tree using Kruskal's algorithm.

Unit 1 : Graphs [03]

(1.1) Definition, Elementary terminologies and results, Graphs as Models.

(1.2) Special types of graphs.

(1.3) Isomorphism.

(1.4) Adjacency and Incidence Matrix of a Graph.

Unit 2 : Operations on Graphs [09]

(2.1) Subgraphs, induced subgraphs,Vertex delition, Edge delition, edge contraction.

(2.2) Complement of a graph and self-complementary graphs.

(2.3) Union, Intersection and Product of graphs.

(2.4) Fusion of vertices.

Unit 3 : Connected Graphs. [09]

(3.1) Walk, Trail, Path, Cycle : Definitions and elementary properties.

(3.2) Connected Graphs : definition and properties.

(3.3) Distance between two vertices, eccentricity, center, radius and diameter of a graph.

(3.4) Isthmus, Cut vertex : Definition and properties.

(3.5) Cutset, edge-connectivity, vertex connectivity.

(3.6) Weighted Graph and Dijkstra's Algorithm.

Unit 4 : Eulerian and Hamiltonian Graphs [08]

(4.1) Seven Bridge Problem, Eulerian Graph : Definition and Examples, Necessary and Sufficient condition.

(4.2) Fleury's Algorithm.

(4.3) Hamiltonian Graphs : Definition and Examples, Necessary Condition.

(4.4) Introduction of Chinese Postman Problem and Travelling Salesman Problem.

Unit 5 : Trees [07]

(5.1) Definition, Properties of trees.

(5.2) Center of a tree.

(5.3) Binary Tree : Definition and properties.

(5.4) Tree Traversal : Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal, Prefix Notation.

(5.5) Spanning Tree : Definition, Properties, Shortest Spanning Tree, Kruskal's Algorithm.

Reference Books:

1) Kenneth Rosen, Discrete Mathematics and It's Applications (Tata McGraw Hill)
2) C. L. Liu ,Elements of Discrete Mathematics, (Tata McGraw Hill)
3) John Clark and Derek Holton, A First Look at Graph Theory (Allied Publishers)
4) Narsingh Deo, Graph Theory with Applications to Computer Science and Engineering, (Prentice Hall).
5) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakasha.

F.Y.B.Sc.(COMPUTER SCIENCE) MATHEMATICS

SEMESTER-II

CS-24 ALGEBRA-II

Course content 36 Lectures

Objectives:

The main objective of this course is to introduce students to some basic concepts in Groups, normal subgroups, homomorphism and isomorphism, Connected Graphs, Eulerian and Hamiltonion Rings and field.

At the end of this course student are expected to be able to.

1) examples of group , subgroup, various properties.
2) operations on a group.
3) study the ring and integral domain.

Unit 1: Groups [17]

(1.1) Binary Operations, Semigroups, Monoids, Groups: Definitions and Examples,Simple, Properties

(1.2) Abelian Group, Finite Group, Infinite Group

(1.3) Order of an element of a Group

(1.4) Subgroups: Definition, Necessary and Sufficient Conditions, Examples on finding subgroups of finite groups, Union and Intersection of Subgroups

(1.5) Cyclic Subgroups: Definition, Simple Properties.

(1.6) Coset : Definition & Simple Properties.

(1.7) Lagrange's theorem (with proof) & its Corollaries .

(1.8) Permutation Groups :Definition of S_n and detail discussion of the group S_3 ,Cycles and Transpositions, Even and Odd Permutations, Order of Permutation, Properties :

a) $0(S_n) = n!$ b) A_n is subgroup of S_n .

Unit 2: Normal Subgroups, Homomorphism & Isomorphism [15]

(2.1) Normal Subgroups: Definition,properties with examples

a) If g is abelian group then every subgroup of G is normal.

b) H is normal subgroup of G iff $xhx^{-1} = H$,

c) H is normal subgroup of G iff every left coset of H in G is also a right coset of H in G . (all with proof).

d) H is normal subgroup of G iff product of two right coset of H in G is also a right coset of H in G.

e) If H is subgroup of index 2 in G then H is normal subgroup of G .

f) If H is the only subgroup in G of a fixed finite order then H is normal subgroup of G. (all without proof.).

(2.2) Quotient Groups: Definition and Examples

(2.3) Homomorphism and Isomorphism: Definitions, Examples, Simple properties.

Unit 3: Rings & Fields [4]

(3.1) Rings , Integral Domains: Definitions ,Some results (without proof),Examples.

(3.2) Fields , Skew Field: Definitions ,Some results (without proof),Examples.

References:

1) J.B. Fraleigh, A. First Course in Abstract Algebra, Third Ed., Narosa, New Delhi, 1990.

2) S.R. Patil, R.S. Bhamare, M.D. Bhagat, D.M. Pandhare; Algebra; Nirali Prakashan, 1998

3) S.R. Patil, R.S. Bhamare, M.D. Bhagat, D.M. Pandhare; Algebra; Nirali Prakashan, 2003.

4) P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul : Basic abstract algebra (second edition).

F.Y.B.Sc. (Computer Science) (ELECTRONICS)

SEMESTER II

CS-25 :Principles of Analog Electronics – II

1. To get familiar with differential amplifiers
2. To understand basics of operational amplifiers
3. To study features of oscillators
4. To study elementary concepts of power supply

Course content **36 Lectures**

1.Differential amplifier **(04)**

Black box concept

Different modes of operation

Parameters of differential amplifier

Differential Amplifier with constant current source

Concept of feedback

Types of feedback

2.Operational Amplifier **(12)**

Introduction to OP-AMP

Block diagram

Concept of virtual ground

OP-AMP IC 741

OPAMP applications - Inverting and non inverting amplifier, adder, subtractor, comparator, integrator and differentiator

Numerical problems.

3.Oscillators **(12)**

Introduction to Oscillators.

Concept of positive feedback

Barkhausen criteria

Classification of oscillators

Weinbridge oscillator, Phase Shift oscillator

Hartley, Colpitt oscillator

Crystal oscillator

Numerical problems.

4.Power Supply **(08)**

Review of rectifiers,

Types of regulations.

Block diagram, working and specifications of regulated power supply

Switching mode power supply **(SMPS**)

Uninterrupted power supply **(UPS**)

REFERENCE BOOKS

1. Integrated circuits by Milliman.
2. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
3. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition,2010
4. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
5. Principals of Electronics: V.K. Mehta, S.Chand and Co.
6. A text book of electrical technology: B.L.Theraja, S.Chand and Co.

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F.Y.B.Sc. (Computer Science) (ELECTRONICS)

SEMESTER II

CS – 26 : Principles of Digital Electronics -II

Objectives:

1. To get familiar with concepts of digital electronics
2. To learn the concept of flip -flops
3. To understand the working of counters
4. To study Shift registers
5. To get introduced to semiconductor memory.

Course content **36 Lectures**

1.Flip-flops **(10)**

Introduction to flip flop

RS flip-flop, Clock R-S flip-flop

JK flip-flop, Master-slave JK flip flop

D and T flip-flop.

Race around condition

Triggering in flip-flops,

Preset Clear, Delay (Definitions only)

Examples of commonly used flip-flops and their applications.

2.Counters **(12)**

Introductions to counters.

Asynchronous counters, Synchronous counter,

Modulus of counter

Ring counter , Up-down counter,

study of IC 7490 (Internal block diagram)

Frequency division in IC 7490(MOD 2,MOD 4, MOD 6 ,MOD 8, MOD 10)

3.Study of shift registers

Serial and parallel data shifting. SISO (right and left shift), SIPO ,PIPO And PISO. Study of IC 7495 .

4.Clock generating circuits **(09)**

Multivibrators

Introduction to IC555,

Working of IC 555 as a clock generator(Astable, monostable, bistable multivibrator),

Working of IC 741 as a clock generator (No derivations expected for the above, only formula and problems)

Duty cycle

Problems.

5.Semiconductor Memory **(05)**

Introduction to memory devices.

RAM,ROM,PROM,EPROM

REFERENCE BOOKS:

1. Digital Electronics: Jain R.P., Tata McGraw Hill
2. Digital Principles and Applications:Malvino Leach, Tata McGraw-Hill.
3. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education

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F.Y.B.Sc. (Computer Science)

SEMESTER II
CSII –L I : LAB COURSE ON ORACLE-II

. **Objectives**

1. To introduce the concepts of PL/SQL Block Structures
2. To understand PL/SQL control Structures
3. To familiar with handling errors, Procedures and triggers.

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Assignment on nested queries.
2. Introduction to PL/SQL blocks structure .
3. Simple PL/SQL blocks
4. Assignments based on PL/SQL Conditional statements
5. Assignments based on PL/SQL Looping statements
6. Usage of procedures.
7. Assignments based on exception Handling
8. Usage of triggers.

NOTE: At least 8assignments must be performed.

Note: An Industrial visit should be arranged and report should be submitted at the end of academic year.

F.Y.B.Sc. . (Computer Science)

CSII –L II : LAB COURSE ON C-II

Objectives

1. To introduce the arrays concept
2. How to handle data of different Structure
3. Introduction to file structure .

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Programs using one dimensional and two dimensional array
2. Programs based on character array. (counting of character words, lines and white spaces etc.)
3. Programs on pointer
4. Programs on Structure and Unions.
5. Programs on structure within structure
6. Programs on File handling.

NOTE : At least 8 assignments must be performed.

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CSII – LIII : LAB COURSE FOR ELECTRONICS -II

Objectives:

1. To use basic concepts for building various applications in electronics.
2. To understand design procedures of different electronic circuits as per requirement.
3. To build experimental setup and test the circuits.
4. To develop skills of analyzing test results of given experiments.

- One activity equivalent to 2 experiments by the student.

a. Electronics project
b. Documentation type experiments
c. Presentation/Seminar on Electronics /advanced topic/research topics.

- ·□One activity equivalent to 2 experiments to be arranged by the teacher – Arrange atleast two practical demonstrations / Workshops /Industrial visit which will enhance quality and skills of the student.
- □Examination will be conducted on 8 experiments as well as on activities

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

List of Topics:

1. Study of 7490 as a counter.
2. Transistor as a switch.
3. FET characteristics.
4. SCR characteristics.
5. Study of logic gates.
6. Study of flip-flops
7. Verification of Demorgan's theorem and conversion of one gate to other.
8. Study of half and full adder and subtractor.
9. Study of shift register IC 7495.
10. Study of up down counter
11. Build and Test Diode matrix ROM
12. Study of Four bit Universal Adder/Subtractor

NOTE : At least 8 Practicals must be performed

F.Y.B.Sc. (Computer Science)

Semester II

CS – 27 : Computer Oriented Statistical Techniques -II

(CBCS 2016 Course)

Total Lectures:- 36

Objectives

The main objective of this course is to introduce to the students the basic concepts of probability, axiomatic theory of probability, concept of random variable, probability distribution (univariate) discrete random variables, expectation and moments of probability distribution. By the end of the course students are expected to be able

(i) to find the probabilities of events.
(ii) to obtain a probability distribution of random variable (one dimensional) in the given situation, and
(iii) to apply standard discrete probability distribution to different situations
(iv) to apply continuous probability distribution to different situations.
(v) to apply small and large sample tests to different situations.

Unit 1. Probability (10)

1.1 Idea of deterministic and non-deterministic models
1.2 Sample space (Finite and countably finite)
1.3 Events : types of events, operations on events
1.4 Probabitity : classical definition, relative frequency approach, probability models
1.5 Axioms of probability
1.6 Probability of events
1.7 Theorems on probability :

1) $0 \leq P(A) \leq 1$
2) $P(A)+P(A')=1$
3) $P(A) \leq P(B)$ when $A \subset B$
4) $P(A \cup B) = P(A)+P(B)-P(A \cap B)$

1.8 Concept and definitions of conditional probability $P(A \cap B)=P(A)\ P(B/A)$
1.9 Concept and definitions of independence of two events
1.10 Numerical problems

Unit 2. Discrete Random Variables and some Standard Discrete Probability Distributions (10)

2.1 Definition of random variable and discrete random variable.
2.2 Definition of probability distribution and distribution, Probability mass function.
2.3 Definition of expectation and variance, theorems on expectation.
2.4 Binomial distribution : definition, mean. Variance, additive property, illustrations of real life situations.
2.5 Poisson distribution : definition, mean, variance, additive property, approximation to binomial, illustrations of real life situations.
2.6 Numerical problems

Unit 3. Continuous random variables and some Standard Continuous Probability Distribution (08)

3.1 Definition through p.d.f.
3.2 Distribution function : definition, statements of properties
3.3 Definitions of mean and variance
3.4 Exponential distribution : p.d.f. with mean, nature of probability curve, mean, variance, lack of memory property.
3.5 Normal distribution : defination of p.d.f., identification of parameters, Probability curve, standard normal distribution.
3.6 Numerical problems

Unit 4. Test of Hypothesis and Some Large and Small sample Tests (08)

4.1 Definitions : random sample, parameter, statistic, standard error of statistic.
4.2 Concept of null and alternative hypothesis, critical region, level of significance, types of error, Concept of test of hypothesis, one sided and two sided tests.
4.3 H_0 ; $\mu = \mu_0$ Vs $H_1 = \mu \neq \mu_0$
4.4 $H_0 = P = Po$ Vs $H_1 = P \neq Po$
4.5 Chi-square test for goodness of fit and 2 X2 contingency table
4.6 t-test for testing H_0 ; $\mu = \mu_0$ Vs $H_1 = \mu \neq \mu_0$
4.7 Numerical problems

Books Recommended

1) Hogg R. V. and Craig, R. G.
Introduction to Mathematical Statistics.
2) Hoel. P. G.
Introduction to Mathematical Statistics.
3) Feller. W
Introduction to probability Theory and it's Applications. Vol –I
4) Mood A. M., Grabill, F. A. Boes D. C.
Introduction to Theory of Statistics.
5) Meyar P. L.
Introduction to Probability and Statistical Applications.
6) Goon, Gupta and Das Gupta
Fundamentals of Statistics Vol I & II
7) S. P. Gupta
Statistical methods.
8) Waikar and Lev.
Elementary Statistical Methods.
9) BIS Publication
Statistical Quality Control (Hand Book)
10) ATAG (Automotive Industries Action Group) :SPC/MMS manuals.
11) Samprit Chatterjee and Bertram Price.
Regression analysis by Example (1991).
John Wiley and sons. Inc.
12) Guilford, J. P. and Fruchter B: Fundamental Statistics in Psychology and Education
(1980), Mc Graw Hill.
13) Mathur, Rajiv. Learning Excel-97 for windows step by step Galgotia

F. Y. B. Sc. (Computer Science)

Semester II

CS-28 : Compulsory English - II

A. Objectives:

a) To encourage and enable the students to read the various types of texts on their own and discuss them among peers.
b) To develop competence among the students for self-learning.
c) To develop their communicative skills and their proficiency in English language.
d) To make students aware of the different communicative skills.
e) To prepare them to function effectively in their future professions.

Prescribed Text: ***Views & Visions: An English Coursebook for Undergraduates*** *by*

Orient BlackSwan

Prose:

1. The Task of Education	*Vinoba Bhave*
2. A Letter by Hazlitt to His Son	*William Hazlitt*
3. The Bet	*Anton Chekov*
4. Curious Mishaps	*Vikram Seth*
5. Refund	*Fritz Karinthy*

Poetry:

1. Polonius to Laertes	*William Shakespear*
2. No Men are Foreign	*James Kirkup*
3. Stopping by Woods on a Snow Evening	*Robert Frost*
4. The Golden Pitcher	*Acharya Vidyasagar Maharaj*

Grammar, Usage and Composition:

1. Degrees of Comparison
2. One-word Substitution
3. Synonyms and Antonyms
4. Paragraph Writing
5. Reading Comprehension
6. Summarising

(Note: All the units as covered in the prescribed text.)

F.Y.B.Sc. (Computer Science)

SEMESTER-II

CS-29 : OPERATING ENVIRONMENT

Course content **36 Lectures**

Objectives:

1) To aware the computer fundamentals
2) To know the structure and working of compute
3) Obtain understanding of the concepts of information technology

.

1. Computer definition, uses, block diagram, functions of ALU, input/output, scanner, plotter, keyboard, mouse, MICR, bar decoder, OCR, joystick, monitor, printer, memory unit and CPU. [7]

2. Software-types, compilers, interpreter, assembler, linker, loader, high level and low-level languages. Files-types and operations, indexed, sequential and hashed

   organization. Sorting, merging, indexing and updating functions, concept of a file allocation table. [8]

3. Operating System-types-timesharing, batch processing, multiprogramming , real- time; functions of operating systems – Introduction to file management, detailed study of DOS and Windows. [7]

4. Networking - Data communication concepts, classification, communication media, LAN, Wan, Man, Internet, Intranet, Extranet , and their efficient use. [7]

5. Study of office 2000(MS-Word, MS-Power Point, MS-Excel) [7]

Reference Books :

1. A First course in computers by Ravi Saxena
2. Computer Fundamentals :Milind Oak
3. Computer Fundamentals : P.K.Sinha

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SEMESTER –III

CS -31 : Object Oriented Programming with C++

COURSE CONTENT **4CREDITS(48 L)**

Learning Outcomes:

Perform object oriented programming to develop solutions to problems demonstrating usage of control structures, modularity, I/O. and other standard language constructs.

Demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.

Demonstrate ability to implement one or more patterns involving realization of an abstract interface and utilization of polymorphism in the solution of problems which can take advantage of dynamic dispatching.

Prerequisites: Knowledge of C Programming Language

1. Principles of Object oriented Programming **[04]**

Object oriented concepts
Features, advantages and Applications of OOPS

2. Introduction to C++ Programming Language **[08]**

Tokens, Expressions ,Control structures
Data types, new operators and keywords, using namespace concept
Simple C++ Program
Introduction to Reference variables
Usage of 'this' pointer
Classes and Objects
Access specifiers
Defining Data members and Member functions
Array of objects

3. Functions in C++ **[12]**

Call by reference, Return by reference
Function overloading and default arguments
Inline function
Static class members
Friend Concept – Function, Class

4. Constructors and destructor **[05]**

Constructor
Types of constructors
Memory allocation (new and delete)
Destructor

5. Operator overloading **[08]**

Overloading function
Overloading Unary and Binary operators
Overloading using friend function
Type casting and Type conversion

6. Inheritance **[06]**

Types of inheritance with examples
Constructors and destructor in derived classes
Virtual base classes, Virtual functions and Pure virtual function
Abstract base classes

7. Managing Input and Output using C++ **[05]**

Managing console I/O
C++ stream classes
Formatted and unformatted console I/O
Usage of manipulators

References:-

1) Object Oriented programming with C++ 4th Edition by e .Balaguruswamy,Tata Mc-Graw Hill Publication.
2) The C++ Programming Language by Bjarne Stroustrup, Addison Wesley, 2000
3) Object oriented programming in C++, Robert Lafore, Galgotia Publication.

S.Y.B.Sc. Computer Science

SEMESTER –III

CS-32 :Introduction To .Net Using C#

COURSE CONTENT **4CREDITS(48 L)**

Learning Outcomes:

1. Giving the students the insides of the .net environment in c#.
2. It covers the concepts of web servers and web application, server design methodology with an object oriented concepts, client side programming, server side programming
3. It also covers usage of recent platform used in developing web applications such as .Net environment like C# and Asp.net

1) Introduction to .Net Technology: **(08 L)**

.Net Framework, common Language Runtime, Common Language Specification, Intermediate Language Code, Just-In-Time Compiler, Assemblies, Manifest, Metadata ,Global assembly Cache

2) Introduction TO C# **(08 L)**

Introducing C#, Overview of C# ,Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations.

3) Exception Handling **(08 L)**

Using Structured Exception(try-catch-finally

4) Windows Forms using C# : **(10 L)**

Text Box, Buttons, Labels, Checks Boxes, radio Buttons, List Boxes, Combo Boxes, Picture Boxes, Scrollbars, Timer, Menus, Built-in Dialogs, Image List, Toolbars, Status Bar and Progress bars, Event and Delegates, Tracing, Debugging

5) Object Oriented Programming: **(08 L)**

Class and Objects Properties, methods and events, Constructor and Destructor, Method overloading, Inheritance, Access modifiers(Public, Private, Protected, Friend), Overriding and shadowing, Interfaces, Polymorphism, Private and Shared Classes

6) File Handling: **(06 L)**

File stream class, Stream Writer, Stream Reader, Binary Reader, Binary Writer Classes ,File and Directory Classes

TEXT BOOKS:

1. E. Balagurusamy, “Programming in C#”, Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, “Programming C#”, 2nd ed., O’Reilly, 2002. (Unit III, IV, V)

REFERENCES:

1. Herbert Schildt, “The Complete Reference: C#”, Tata McGraw-Hill, 2004.

2. Robinson et al, “Professional C#”, 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, “C# and the .NET Platform”, A! Press, 2003.
4. Thamarai Selvi, R. Murugesan, “A Textbook on C#”, Pearson Education, 2003.
5. Programming Microsoft ASP.NET Dino Esposito

S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER – III

CS- 33 : Linear Algebra

COURSE CONTENT **4CREDITS(48 L)**

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in Linear equations and matrices, General vector spaces, Eigen Values and Eigen functions and linear transformation.

At the end of this course student are expected to be able to.

(i) Know linear system, matrix transformtaion, solution of linear systems of equations, and LU decomposition.

(ii) Know the real vector spaces, subspaces, linear independence, basis and dimensions.

(iii) Find linear dependence, linear span, basis and dimension of vector spaces.

(iv) Solve kernel and range of linear transformation..

[1] Linear Equations and Matrices **[12]**

(1.1) Linear systems
(1.2) Matrices
(1.3) Dot Product and Matrix Multiplication
(1.4) Matrix Transformations
(1.5) Solutions of Linear Systems of Equations
(1.6) LU- Factorization.

[2] General Vector Spaces **[12]**

(2.1) Real vector spaces.
(2.2) Subspaces.
(2.3) Linear independence.
(2.4) Basis and dimensions.
(2.5) Row space, column space and null space.
(2.6) Rank and Nullity.

[3] Eigen values and Eigen vectors **[12]**

(3.1) Eigen values and Eigen vectors.
(3.2) Diagonalization.
(3.3) Quadratic forms.
(3.4) Using scilab : (i)Find Eigen values and Eigen vectors.
(ii) Diagonalization

[4] Linear Transformations **[12]**

(4.1) General linear transformations.
(4.2) Kernel and range. (Rank nullity theorem without proof.)

(4.3) Inverse linear transformation.
(4.4) Matrix of general linear transformation.

TEXT BOOKS:

(1) S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Nirali Prakashan
(2) S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Vision Publication
(3) F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Nirali Prakashan
(4) F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Vision Publication
(5) Elementary Linear Algebra (Applications Version) by Howard Anton, Chris Rorres. (Seventh Edition) John Wiley & Sons, Inc.
Sections: 5.1 to 5.6, 7.1, 7.2, 9.5, 9.6, 8.1 to 8.4
(6) Discrete Mathematical Structures (sixth edition), Kolman, Busby and Ross. PHI.
Sections: 9.5, 11.1 to 11.3

REFRENCE BOOKS:

(1) M. Artin, Algebra, Prentice Hall of India , New Delhi, (1994).
(2) K. Hoffmann and R. Kunze Linear Algebra, Second Ed. Prentice Hall of India New Delhi, (1998).
(3) S. Lang, Introduction to Linear Algebra, Second Ed. Springer-Verlag, New Yark, (1986).
(4) A. Ramchandra Rao and P. Bhimasankaran, Linear Algebra, Tata mcgraw Hill, New Delhi (1994).
(5) G. Strang, Linear Algebra and its Applications. Third Ed. Harcourt Brace Jovanovich, Orlando, (1988).

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S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER-III

CS- 34 : COMPUTER ORIENTED NUMERICAL METHODS

COURSE CONTENT **4CREDITS(48 L)**

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in PERT and CPM, solution of non linear equation, polynomial interpolation, numerical differentiation and integration solution of ODE and simultaneous linear equation.

At the end of this course student are expected to be able to.

(i) Know forward and backward pass computation slack, critical path of PERT and CPM terms.

(ii) Solve non linear equation by using bisection, secant , regula- falsi, Newton- Raphson methods .

(iii) Create a polynomial by using Newton's backward and forward formulae, Lagrange's interpolation formulae, Hermite interpolation.

(iv) Solve integration by using Bisection, Secant, Regula-Falsi and Newton-Raphson methods

(v) Solve differential equation examples on Euler's method, Runge-Kutta second and fourth Order formula.

[1] PERT and CPM Computations **[10]**

(1.1) Phases of project schedulding

(1.2) Network logic , numbering the events (Fukerson's rule.)

(1.3) Measure of activity

(1.4) PERT: forward and backwad pass computations slack , critical path.

(1.5) CPM terms, critical path, float.

(1.6) Using scilab

i. Use of ' deff ' command for one and two variables functions.

ii. Draw 2-D and 3-D graph for some standard functions.

E.g. x^2 , sin (x), exp(x), x^3+y^3 etc .

[2] Solutions of Non – linear Equations **[10]**

(2.1) Location of Roots

(2.2) Bisection, Secant, Regula-Falsi and Newton-Raphson methods, Comparison Of these methods

(2.3) Acceleration of convergence Aitken's Process

(2.4) Regula-Falsi method and Newton-Raphson method using Scilab.

[3] Polynomial Interpolation & Approximation **[10]**

(3.1) Finite differences: Forward, Backward and Central

(3.2) Detection of errors using different tables

(3.3) Newton's backward and forward formulae for interpolation
(3.4) Lagrange's interpolation formulae for unequal intervals
(3.5) Least square approximation by Polynomials up to third degree
(3.6) Hermite Interpolation.
(3.7) Newton Forward, Newton Backward and Lagrange's Interpolation by using Scilab

[4] Numerical Differentiation and Integration [10]

(4.1) Numerical differentiation using interpolating polynomials
(4.2) Trapezoidal rule, Simpson's (1/ 3)rd rule and Simpson's (3/8)th rule
(4.3) Extrapolation to the limit : Ramberg Interpolation
(4.4) Numerical integration by Simpson's (1/3)rd, numerical integration by Simpson's (3/8)th rule, rule by using Scilab

[5] Solution of Ordinary Differential Equations &solution of Simultaneous Linear Equations [08]

(5.1) Numerical Integration By Tayler Series
(5.2) Euler's method
(5.3) Runge-Kutta method: 2nd and 4th orders
(5.4) Predictor corrector method
(5.5) Gaussian Elimination, Pivoting Strategy, Conditional Equations
(5.6) Modification of Gaussian Elimination to Compute Inverse of Matrix
(5.7) Comparison of direct and iterative methods
(5.8) Examples on Euler's method, Runge-Kutta second and fourth order formula by using Scilab.

Text Books :

Prof S.R.Patil; Prof S.G.Gujrathi; Prof D.M. Pandhare;
Numerical Methods And Operation Research; Nirali Prakashan,1998.

Reference Books:

1.S.S.Sastry; Introductory methods of Numerical Analysis ; Prentice-Hall of India (3rd edition) 2000
2. J.H.Mathews; Numerical methods for Mathematics, Science and Engineering (2nd edition); Prentice-Hall of India ,1994.
3. R.J. Dromey; How To Solve It By Computer; Prentice-Hall Of India; 1982
4. Anthony Ralston,Philip Rabinowitz; A First Course in Numerical Analysis; (2nd edition) International Student edition; mcgraw-Hill Book Company; TOKYO; 1978
5. Computer Oriented Numerical Methods-Rajaraman.
6. Introduction To Numerical Analysis-C.E. Froberg.
7. Introduction To Applied Numerical Analysis-C.E.Froberg.
8. Numerical Methods that works-Forman S. Action.
9.Numerical Methods in Fortran-J.M.Mcormik.
10. Numerical Methods For SC & Engg - R.G.Stanton (Prentice Hall)

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S.Y.B.Sc. Computer Science(Electronics)

SEMESTER – III

CS-35 : Digital systems and Microprocessors

COURSE CONTENT 4CREDITS(48 L)

Learning outcomes

- To study the concept of data convertors and its applications.
- To use memory concepts for digital circuit design.
- To study and understand basics of microprocessors
- To understand fundamentals of multicore technology

1. Data Converters (12 L)

Digital to Analog Converter (DAC): Resistive divider, R-2R ladder, Parameters of DAC. Analog to Digital Converter (ADC): Types of ADC- Flash, Successive approximation, dual slope. Parameters of ADC. Applications of DAC and ADC .

2. **Memory organization (12 L)**

Memory Architecture, Memory Hierarchy, Introduction to USB storage device, Memory parameters like Access time, speed, capacity, cost , Associative Memory, Cache memory, cache mapping techniques, virtual memory, virtual memory mapping: paging and segmentation.

3. Computer Organization (12L)

Concept of Address Bus, Data Bus, Control Bus. Register based CPU organization, stack organization, I/O organization: need of interface, block diagram of general I/O interface. Working concepts like polling, interrupt initiated data transfer.

Concept of DMA , DMA transfer, DMA Controller Serial communication: Synchronous, asynchronous and their data transmission formats, RS–232, General block diagram of PPI and UART

4. Microprocessor (12L)

Introduction, General register organization, Stack Organization, Instruction formats, Addressing modes .Generations of microprocessors, general operation of microprocessors. Concept of RISC and CISC, Von-Neumann & Harvard Architecture, Concept of pipeline. Architecture of basic microprocessors 8086 and basic version of Pentium .Concept of multicore processors.

Reference books

1. Microprocessor and interfacing by Douglas Hall, Tata Mcgraw-Hill Edition
2. Computer organization and Architecture by William Stallings
3. The Intel Microprocessor by Barry B.Brey.
4. Computer architecture and organization by Rifiqzaman and Chandra.
5. Computer Organization J.P. Hays TMH
6. The Pentium Microprocessor by James Antonakos(PEA)
7. The Intel Microprocessor by Barry.B.Brey
8. Digital design : M. Morris Mano, Prentice-Hall of India

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S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER – III

CS-36 : Principles of Communication

Learning outcomes

- To understand basics of communication systems.
- To understand modulation, demodulation and multiplexing of signals.
- To understand digital communication techniques
- To introduce concepts in advanced wireless communication

COURSE CONTENT 4CREDITS(48 L)

1. Introduction to Electronics Communication (08L)

Importance of Communication, Elements of communication systems, Electromagnetic spectrum, type of communication, Concepts of communication system: channel bandwidth, Nyquist theorem, S/N ratio, channel capacity, error handling, Shannon theorem, concept of companding, Data rate, baud rate, serial communication and protocol.

2. Modulation and Demodulation. (16L)

Introduction to concepts of modulation and demodulation. Modulation techniques: Analog modulation: Amplitude, Phase and Frequency modulation, Circuit diagram and working of transistorized amplitude modulator and diode demodulator. Equation of amplitude modulated wave, modulation index and frequency spectrum.

Digital modulation, PAM, PCM, delta modulation, MODEM – concept of ASK, FSK, QPSK, MSK, GMSK.

3. Multiplexing and Multiple Access Techniques. (12L)

Multiplexing ,Space division multiplexing, Time division multiplexing, Frequency Division Multiplexing, Code division multiplexing, Introduction to multiple access, FDMA, TDMA,CDMA

4. Introduction to wireless and Mobile Communication. (12L)

Introduction to wireless communication system and its concept. Introduction to antennas,working principle and parameters of antenna.Introduction to mobile communication, Cellular concept, Working of GSM: Hand over, Introduction to GPRS, Wi-Fi and blue tooth Applications. Introduction to RFID, Zigbee.

Recommended Books:

1. Digital and Data Communication, 4th edition by Micheal A. Miller.
2. Communication Electronics by Frenezel Louis E.
3. Wireless Communication, 2nd edition. Rappaport.
4. Mobile Communication. Schiller Jochen.
5. Wireless Communications and Networks. William Stallings

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S.Y.B.Sc. Computer Science

CS –III-LI : Lab Course on C++ and Data Structures-I

Practical Examination
A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .
40 marks: Practical work 30 marks and 10 marks for oral

PROGRAM LIST IN C++

1. Write a program in C++ to implement class concept for creating and displaying employee data.
2. Write programs in C++ to implement function overloading and operator overloading(unary, binary , relational).
3. Write a program in C++ to implement Write a program in C++ to implement virtual function.
4. Write a program in C++ to implement constructor and destructor to calculate net salary of n employees.
5. Write a program in C++ to implement the concept of inline functions.
6. Write a program in C++ to use scope resolution operator for member definition.
7. Write a program in C++ to implement how a function can act as a friend with one or more classes.
8. Write programs in C++ to implement simple, hybrid, multiple , multilevel inheritance ..

S.Y.B.Sc. Computer Science

CS-III-LII : Lab course on .NET – I

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

40 marks: Practical work 30 marks and 10 marks for oral

1. Create basic calculator utility in c#.
2. Write c# program using timer & progress bar controls
3. Write a program in c# using list box control , check box control, radio buttons**.**
4. Write program in c# for implementing single and multiple inheritance.
5. Write program in c# for implementing interface, polymorphism
6. Write c# program for exception handling. (Try-Catch)
7. Write program using File handling in c#
8. Write program using control structures.

S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER-III

CSIII- LIII: Lab Course on Electronics -III

2 Credits

Learning outcomes

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

- Examination will be conducted on 8 experiments .

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks	
Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

(Note : Any 8 experiments should be performed)

1. Study of SMPS.
2. Study of 8038 function generators.
3. .DC motor drive and speed control.
4. I-V characteristics temperature sensor AD 590.
5. Analog multiplexers.
6. Analog to Digital converter using discrete components/IC LM 234/74148 or IC 7109/Flash ADC
7. Digital to Analog converter using discrete components.
8. Comparison of Monostable using IC-741 and IC-74121.
9. Simple assembly language program : addition,subtraction
10. Simple assembly language program: multiplication, division
11. Simple assembly language program to find smallest and largest number.
12. LM-35 based temperature sensing system/Optocoupler /opto-isolator base system.
13. Low Pass Filter and High Pass Filter using IC-741 Op Amp.
14. Build and test Hamming Code generator and detector circuit Thumbwheel to seven segment display

S.Y.B.Sc. Computer Science(Electronics) CBCS

S.Y.B.Sc. Computer Science

SEMESTER – IV

CS-47 : CLOUD COMPUTING -II

COURSE CONTENT
4CREDITS(48 L)

Learning Outcomes:

1. To study cloud computing concepts;
2. Enhancing cloud computing environment.
3. To study various platforms
4. To study the applications that uses cloud computing

1. **Virtualization :**Introduction, Characteristics of Virutalized environments, Taxonomy of Virtualization techniques, Pros and Cons of Virtualization. (8L)

2. **Storage in Cloud** -Storage system architecture, Big data, Virtualize data centre(VDC) architecture,VDC Environment, storage, networking. (8L)

3. **Security in Cloud Computing :** Introduction, Global Risk and Compliance spects in cloud environments and key security terminologies, Technologies for Data security, Data security risk. (10L)

4. **Applications:** business applications, management applications, social applications, entertainment applications (8L)

5. **Cloud computing platforms:** cloud platforms and challenges. (5L)

6. **Advance concepts in cloud computing:**
   Basics and Vision, Applications and Requirements, Smart Devices and Services, Human Computer Interaction. (9L)

Books:
Cloud Computing: A Practical Approach for Learning and Implementation - Srinivasan

S.Y.B.Sc. Computer Science

SEMESTER – IV

CS-48 : DATA WAREHOUSING AND DATA MINING- II

COURSE CONTENT 4CREDITS(48 L)

Learning Outcomes

1) Study and understand various algorithms used for data mining
2) Be able to analyze the data using existing data mining tools
3) Be able to apply operations like association , classification and clustering for a given dataset

1. Data preprocessing (6 L)
   Need, Objectives and techniques ,Data cleaning ,integration ,transformation, reduction, discretization
2. Data mining concepts (4 L)
   Data mining architecture , evolution of database technology , Types of data that can be mined ,functionalities, classification, major issues
3. Association rule mining (6 L)
   Basic concepts, market basket analysis, road map, classification of association rule
4. Classification and prediction (10 L)
   Classification concept ,prediction, issues regarding classification and prediction,comparing classification methods,decision trees ,attribute selection measures
5. Cluster Analysis (6 L)
   Introduction ,need ,clustering methods,types of data in cluster analysis ,partitioning methods
6. Cases (2 L)
   Case studies

Text Book :-
Data mining concepts and techniques - Jiawei Han and Micheline Kamber

S.Y.B.Sc. Computer Science

Semester IV

CS - 41 : Data Structures using C++

COURSE CONTENT **4CREDITS(48 L)**

Learning Outcomes

- To teach fundamental data structures, which allow one to store collections of data with fast updates and queries.
- To efficiently implement the different data structures .
- To efficiently implement solutions for specific complex problems.

Prerequisites: Students are expected to be proficient in a high level object oriented programming language like C++

1. INTRODUCTION TO DATA STRUCTURES **[06]**

Abstract Data type, data object, data structures , algorithm analysis, space and time complexity

2. SORTING AND SEARCHING TECHNIQUES **[06]**

Bubble, Selection, Insertion, Shell sorts and Sequential, Binary, Indexed Sequential Searches, Binary Search Tree Sort, Heap sort, Radix sort

3. STACK AND QUEUE **[08]**

Stacks: LIFO structure, create, POP, PUSH, multiple stacks, ,hashing ,applications

Queues: FIFO structure , Priority Queues, Circular Queues, operations on Queues

4. LINKED LISTS **[08]**

Concept, Node structure ,Types of linked list, Linked List Data Structure and operations like Create List, Insert Node (empty list, beginning, Middle, end), Delete node(First, general case), Search list, Retrieve Node, add node, Remove node, Print List , Circularly-Linked List , Doubly Linked List(Insertion, Deletion)

5. TREES **[10]**

Tree terminologies, binary tree concept, types of binary trees, operations performed on it , binary Search tree ,Expression trees, AVL trees ,threaded binary tree, Tree traversals, applications.

6. GRAPHS **[10]**

Definition, types of graph , terminologies , representation in memory, graph data structures,Operations on graph, Breadth first search, Depth first search , Shortest path problem, spanning tree concept ,topological sort.

References:-

1. Data Structures and Algorithm Analysis in C++, Michael T. Goodrich, Wiley student edition, 2007.
2. Data Structures Using C++, Sahni ,The McGraw-Hill, 2006.
3. Schaum's Outlines Data structure, Seymour Lipschutz, Tata McGraw Hill 2nd Edition
4. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 2nd Edition, Pearson Education , 1997
5. Data Structures Using C and C++ by Tanenbaum amd Moshe, 1998

S.Y.B.Sc. Computer Science

SEMESTER-IV

CS-42 ASP.Net

COURSE CONTENT 4CREDITS(48 L)

Learning Outcomes

1) Introduction to ASP.NET (08L)
Asp.net Component Model, ASP.NET Development Stack, Difference between C# and ASP.NET

2) Introduction to ADO.NET (10L)
.Net Data Access Infrastructure, Connected Architecture using ADO.Net, Data reader, Connection objects, command Objects.

3) Disconnected architecture using ADO.Net (08L)
Data adapters, and Datasets, Data binding with controls, Navigating data source ,Data from wizard

4) Crystal Report (06L)
Connection to Database, Building Reports, Modifying Report, Header,Footer, Details, Group Header, Group Footer, Summary ,Working with Multiple tables

5) Web application: (08L)
Introduction to Web form, page directive, Page redirection

6) Web services: (04L)
Concept of web services, Create a small web services

7) Deployment: (04L)
Deploying applications using wizard

TEXTBOOKS:

1. E. Balagurusamy, “Programming in C#”, Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, “Programming C#”, 2nd ed., O’Reilly, 2002. (Unit III, IV, V)

REFERENCES:

1. Herbert Schildt, “The Complete Reference: C#”, Tata McGraw-Hill, 2004.
2. Robinson et al, “Professional C#”, 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, “C# and the .NET Platform”, A! Press, 2003.
4. Thamarai Selvi, R. Murugesan, “A Textbook on C#”, Pearson Education, 2003.
5. Programming Microsoft ASP.NET Dino Esposito

S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER-IV

CS- 45 : 8051 MICROCONTROLLER

Learning outcomes

- To study the basics of 8051 microcontroller
- To study the Programming and interfacing techniques of 8051
- To apply knowledge of 8051 to design different application circuits
- To introduce the basic concepts of advanced Microcontrollers

COURSE CONTENT **4CREDITS(48 L)**

1. Introduction to 8051 microprocessor [08L]

Introduction to microcontrollers, difference between a microcontroller and microprocessor. Architecture of 8051:Block Diagram of 8051 and Study of Internal Blocks, Pin configuration of 8051,Reset and Clock,Registers, Flags and Internal Memory, SFRS, I/O Ports. Input/Output, Ports, internal memory, External memory.

2. 8051 Instruction Set [12L]

Study of 8051 Instruction Set and Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives .Data transfer, Arithmetic, Logical, JUMP, Loops & CALL instructions, Bit manipulation Instructions.

3. Facilities In 8051 [18L]

Programming 8051 timers, counter programming timer interrupts,
Timer and Counter: Timer and Counters, Timer modes, Programming for time delay in Mode 1 and Mode 2 using assembly and C. Introduction to interrupt ,Interrupt types and their vector addresses. Interrupt enable register and interrupt priority register(IE,IP), Synchronous and asynchronous serial communication , Programming serial port without interrupt, Use of timer to select baud rate for serial communication.

4. Interfacing: [10L]

Interfacing ADC, DAC, LCD, stepper motor.

Recommended Books:

1. "The 8051 Microcontroller and Embedded systems using Assembly and C", by Rolin D.MckinlaySecond Edition. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. by Mckinlay.
2. "The 8051 Microcontroller Architecture, Programming & Application", K.Uma Rao and AndhePallavi, Pearson publications.
3. Programming and customizing the 8051 microcontroller by Myke Predko.
4. ARM System Developers guide: Sloss, Andrew n. Symes.
5. Design with PIC microcontrollers: Peatman, Pearson publications.

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S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER-IV

CS-46 : Analog Systems

COURSE CONTENT **4CREDITS(48 L)**

Learning outcomes

- To understand basics of analog electronics
- To study different types of sensors
- To understand different types of signal conditioning circuits
- TO APPLY KNOWLEDGE OF ANALOG SYSTEMS IN DIFFERENT APPLICATIONS

1. Measurments, Instrumentation And Calibration [2L]

Measurements, Units, Standards Instrument, instrumentation, Calibration

2. Trancducers And Sensor [10L]

Definition of sensors and transducers. Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensors (LM-35 and AD590), pH sensor, piezoelectric humidity sensor, optical sensor (LDR), displacement sensor (LVDT), Passive Infrared sensor (PIR), tilt sensor, touch sensor, ultrasonic sensor

3. Signal Conditioning [18L]

Principles of signal conditioning, Signal conditioning of passive sensors using bridge circuit:Wheatstone 's bridge, Level Shifter, Amplifier, Three OP-amp instrumentation amplifier, Filters;active and passive filters. Working principle of Single order Op-Ampbased Low Pass Filter, High Pass Filter, Band Pass Filter, Notch Filter, Band reject filter;Working of Voltage to frequency Converter using OpAmp.

4. Case Study [14L]

Temperature monitoring system using LM35, Water Level Indicator system using float switch, Electrocardiography (ECG).

5. Introduction to Quantum dots, its applications**. [4L]**

Books Recommended

1. Electronic Instrumentation: H. S. Kalsi: TMH: 2nd Ed.
2. Modern Electronic Instrumentation and Measurement Techniques: Albert D.
3. Helfrick, William D. Cooper: PHI publications
4. Electronic measurements : K.A. Bakshi, A. V. Bakshi and U. A. Bakshi, Technical publications. A Course in Electrical and Electronic measurements and Instrumentation: A.K. Sawhney:
5. Dhanpat Rai & Sons Educational & technical publishers
6. Transducers & Instrumentation - Murthy PHI (Unit 1)
7. Instrumentation Measurements & Analysis- Nakra & Chaudhry TMH
8. Instrumentation Devices & Systems - Rangan, Sarma, Mani TMH
9. Sensors & Transducers : Dr. A. D. Shaligram: CTC publications
10. Op-Amps and Linear Integrated Circuits: Ramakant Gaikwad: PHI: 4th Ed.

S.Y.B.Sc. Computer Science

SEMESTER-IV

CS –IV-LI : Lab Course On C++ and Data Structures-II

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

40 marks: Practical work 30 marks and 10 marks for oral

PROGRAM LIST IN DATA STRUCTURES

1. Write a program in C++ to implement sorting algorithms like simple exchange sort, insertion sort and selection sort

2. Write a program in C++ to implement searching techniques like linear search and binary search.

3. Write a program in C++ to implement simple linear Stack with its basic operations like push(),POP()

4. Write a program in C++ to implement simple linear Queue and its operations.

5. Write a menu driven program that implements singly linked list for the following operations:
Create, Display, add a new node, delete a node

6. Write a menu driven program that implements doubly linked list for the following operations:
Create, Display, insert and delete

7. Write a program in C++ to implement insertion and deletion in B tree.

8. Write a menu driven program in C++ to
a. Create a binary search tree
b. Traverse the tree in Inorder, Preorder and Post Order

9. Write a program in C++ to implement binary search tree.

10. Write a program in C++ to implement simple linear Queue and its operations using linked list.

11. Write a program in C++ to implement stack and its operations using linked list.

S.Y.B.Sc. Computer Science

SEMESTER – IV

CS-IV-LII : Lab Course On .NET-II

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B) Annual examination: Maximum marks: 60 Marks and duration is 3 Hrs .

40 marks: Practical work 30 marks and 10 marks for oral

1. Write program to create ado.net connectivity using connected architecture. (using Connection, Data reader , command object) & display data in List box.

2. Write program to create ado.net connectivity using disconnected architecture.(using Connection ,Data Adapter ,Data dataset object) & display data in textboxes & navigate data. (first ,prev, next, last)
   Write ASP.NET program using ado.net for multiple table connection through wizard (textbox, list box)
3. Create crystal report .
4. Write ASP.NET program for exception handling. (Try-Catch)
5. Create WebApplication using Validation Controls
6. Create small WebServices
7. Create application using deployment.
8. Write program using ado.net to connect data grid .

SEMESTER-IV

CSIV- LIII : Lab Course on Electronics -IV

2Credits

Learning outcomes

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

- Examination will be conducted on 8 experiments.

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribution of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

(Note : Any 8 experiments should be performed)

1. Absolute decoding and linear select decoding.

2. Temperature to frequency / voltage converter
3. Reed relay control using digital logic
4. Build and test Amplitude Modulator and Demodulator.
5. Build and test Frequency Shift Keying.
6. Build and test TDM.
7. Study of pulse amplitude modulation.
8. Demonstration of working of Wi-fi card.
9. Demonstration Experiment on RFID application.
10. Build and test LDR based light control system.
11. Study of Linear Variable Differential Transformer.
12. Build and test Instrumentation Amplifier.
13. Study of radiation pattern of antenna.
14. 8051 Microcontroller programs:Arithmetic, logical & code conversion problems using assembly/C programming
15. Interfacing the thumbwheel & seven segment display.
16. Traffic light controller using microcontroller.
17. Interfacing LCD to Microcontroller.
18. To study waveform generator (square, triangular and saw tooth using DAC) with microcontroller
19. Study of radiation pattern of antenna.

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S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER-IV

CS- 43 : COMPUTATIONAL GEOMETRY

COURSE CONTENT

4CREDITS(48 L)

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in Two dimensional transformations, Three dimensional transformations, plane curves, space curves.

At the end of this course student are expected to be able to.

(i) Know representation of points, lines, transformation and matrices, various type of transformation.

(ii) Solve multiple transformation and projection of 3 dimensional .

(iii) Find equidistance points on ellipse, circle, parabola, hyperbola.

(iv) Know the introduction and properties of Beizer curve, and B-spline curve.

[1] Two Dimensional Transformations **[12]**

(1.1) Introduction
(1.2) Representation of points
(1.3)Transformation and matrices
(1.4) Transformation of points
(1.5) Transformation of straight line
(1.6) Midpoint transformation
(1.7) Transformation of parallel lines
(1.8) Transformation of intersecting lines
(1.9) Transformations: rotation, reflection, scaling, shearing
(1.10) Concatenated transformations
(1.11) Transformation of a unit square
(1.12) Solid body transformations
(1.13) Translations and homogeneous coordinates
(1.14) Rotation about an arbitrary point
(1.15) Reflection through an arbitrary line
(1.16) Overall scaling , point at infinity
(1.17) Projection – a geometric interpretation of homogeneous cordinates

[2] Three Dimentional Transformations **[12]**

(2.1) Introduction

(2.2) Three Dimentional-Scaling, Shearing , Reflection, Translation,Rotation

(2.3) Multiple Transformation

(2.4) Rotation About - an axis parallel to a coordinate axis, an arbitrary axis in space

(2.5) Reflection through an arbitrary plane.

(2.6) Affine and Perspective Geometry.

(2.7) Orthographic Projections.

(2.8) Axonometric Projections.

(2.9) Oblique Projections

(2.10) Single Point Perspective Transformations.

(2.11) Vanishing Points

[3] Plane Curves **[12]**

(3.1) Introduction

(3.2) Curve representation

(3.3) Non-parametric curves.

(3.4) Parametric curves.

(3.5) Parametric representation of circle.

(3.6) Parametric representation of ellipse.

(3.7) Parametric representation of parabola.

(3.8) Parametric representation of hyperbola

[4] Space Curves **[12]**

(4.1) Beizer Curves –Introduction , Definition, Properties (without proof), Curve Fitting (Upto n=3), Equation of Curves in Matrix form (upto n=3)

(4.2) B-Spline Curve-Introduction ,Definition, Properties (without proof)

TEXT BOOKS:

1. S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Nirali Prakashan
2. S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Vision Publication
3. S.Y.B.Sc. (Computer Science) Sem.-II, Paper-I, Computational Geometry, Nirali Prakashan
4. S.Y.B.Sc. (Computer Science) Sem.-II, Paper-I, Computational Geometry, Vision Publication
5. F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Nirali Prakashan
6. F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Vision Publication
7. D. F. Rogers, J. A. Adams, Mathematical elements for Computer graphics, Mc Graw Hill Intnl Edition.

REFRENCE BOOKS:

(1) G.S. Pandey And R.R.Sharma; Vector and Geometry ; Wishwa Prakashan

(2) P. Balsubrahamanyam, K.G. Balsubrahamanyam, G.R.Venkataraman;

Coordinate Geometry of two and three Dimensions; Tata mcgraw-HILL, New Delhi

(3) David F. Rogers, J Alan Adams; Mathematical Elements for Computer Graphics (Second Edition); mcgraw-HILL International Editions.1990

(4) William M. Newman, Robert F. Sproul; Principles of Interactive computer Graphics (Second Edition); International Student Edition, Mcgraw-Hill Book company, Tokyo. 1979.

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S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER – IV

CS – 44 : OPTIMIZATION TECHNIQUES

COURSE CONTENT

4CREDITS(48 L)

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in linear programming, transportation problem, assignment problem and game theory.

At the end of this course student are expected to be able to.

(v) Know formulation, graphical method and simplex method, duality of L.P.P.

(vi) To find the initial basic feasible solution and optimal solution by using North-West corner method, Least cost method, VAM method, MODI method of a transportation problem.

(vii) To find initial optimal solution by using Hungarian method, with their types.

(viii) Solve the game by using graphical method, dominance method.

[1] Linear Programming :- **[12]**

(1.1) Advantages, Limitations, Definitions, Terminology, Formulation of L.P.P.

(1.2) Solution by Graphical Method & Simplex Method, special Cases

(1.3) Duality – concept, Interrelation between a Primal and Dual, Advantages, Interpretation of dual

(1.4) Solution of L. P. P. by simplex method (verification by TORA **)**

[2] Transportation Problems :- **[12]**

(2.1) Introduction, General structure of transportation problem

(2.2) Unbalanced transportation problem

(2.3) North-West Corner Method, Least Cost Method, Vogel's Approximation Method

(2.4) MODI Method

(2.5) Degeneracy in transportation problem

(2.6) Maximization in transportation problem

(2.7) Prohibited transportation problem

(2.8) Numerical problems

(2.9) Transportation problem (verification by TORA)

[3] Assignment Problems :- **[12]**

(3.1) Statement and mathematical representation of assignment problem
(3.2) Unbalanced assignment problem
(3.3) Hungarian method of solving A.P. (Minimization Case)
(3.4) Maximization assignment problem
(3.5) Multiple assignment problem
(3.6) Prohibited assignment problem
(3.7) Numerical problems
(3.8) Assignment problem (verification by TORA)

[4] Theory of games **[12]**

(4.1) Two persons zero sum game, pure and mixed strategies, statement of The mini-max theorem
(4.2) Graphical method for solving 2xm principles and dominance and Nx2 games and solving some simple games

(4.3) Connection between the game problem and L. P. P., Simple games

Text Books :

Prof S.R.Patil; Prof S.G.Gujrathi; Prof D.M. Pandhare;
Numerical Methods And Operation Research; Nirali Prakashan,1998.

Reference Books:

1.

1. R.J. Dromey; How To Solve It By Computer; Prentice-Hall Of India; 1982
2. V.K.Kapoor; Operations Research; Sultan Chand & Sons Educational Publishers, New Delhi; 1985.
3. S.D.Sharma; Operations Research;Kedar Nath Ram Nath & Co. Publishers, Meerut, 1972.
4 L.C. Jhambh; Quantitative Techniques Vol I & II; Everest Publishing House, Pune-1998.
5. N.D. Vohra; Quantitative Techniques in Management (Second Edition); Tata mcgraw-Hill Publishing Company Limited New Delhi; 1990.
6. Kanti Swarup, P.K.Gupta, Man Mohan; Operations Research; Sultan Chand & Sons Educational Publishers, New Delhi, 1977.
7. P.K.Gupta, D.S.Hira; Operations Research ; S.Chand & Company Ltd, New Delhi. 1979.
8. N.Paul Loomba; Linear Programming TMH Edition; Tata mcgraw-Hill Publishing Company Limited, New Delhi, 1971.

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Course Structure of S.Y. B.Sc.(Computer Science) Degree Programme CBCS
Subject : Electronics

Revised Syllabus

To be implemented from the academic year 2017-18

S.Y.B.Sc(Computer Science): Semester III(From the Academic Year 2017-18)

Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
					Continuous Internal Assessment	University Examination	Total
CS -35	Digital systems and Microprocessors	04	04	03	40	60	100
CS -36	Principles of Communication	04	04	03	40	60	100
CSIII-LIII	Lab Course on Electronics -III	04	02	03	40	60	100

S.Y.B.Sc(Computer Science): Semester IV (From the Academic Year 2017-18)

Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
					Continuous Internal Assessment	University Examination	Total
CS -45	8051 Microcontroller	04	04	03	40	60	100
CS -46	Analog Systems	04	04	03	40	60	100
CSIV-LIII	Lab Course on Electronics –IV	04	02	03	40	60	100

S.Y.B.Sc. Computer Science(Electronics)

SEMESTER – III

CS-35 : Digital systems and Microprocessors

COURSE CONTENT
4CREDITS(48 L)

Learning outcomes

- To study the concept of data convertors and its applications.
- To use memory concepts for digital circuit design.
- To study and understand basics of microprocessors
- To understand fundamentals of multicore technology

1. Data Converters (12 L)

Digital to Analog Converter (DAC): Resistive divider, R-2R ladder, Parameters of DAC. Analog to Digital Converter (ADC): Types of ADC- Flash, Successive approximation, dual slope. Parameters of ADC. Applications of DAC and ADC .

2. **Memory organization (12 L)**

Memory Architecture, Memory Hierarchy, Introduction to USB storage device, Memory parameters like Access time, speed, capacity, cost , Associative Memory, Cache memory, cache mapping techniques, virtual memory, virtual memory mapping: paging and segmentation.

3. Computer Organization (12L)

Concept of Address Bus, Data Bus, Control Bus. Register based CPU organization, stack organization, I/O organization: need of interface, block diagram of general I/O interface. Working concepts like polling, interrupt initiated data transfer.

Concept of DMA , DMA transfer, DMA Controller Serial communication: Synchronous, asynchronous and their data transmission formats, RS–232, General block diagram of PPI and UART

4. Microprocessor (12L)

Introduction, General register organization, Stack Organization, Instruction formats, Addressing modes .Generations of microprocessors, general operation of microprocessors. Concept of RISC and CISC, Von-Neumann & Harvard Architecture, Concept of pipeline. Architecture of basic microprocessors 8086 and basic version of Pentium .Concept of multicore processors.

Reference books

9. Microprocessor and interfacing by Douglas Hall, Tata Mcgraw-Hill Edition
10. Computer organization and Architecture by William Stallings
11. The Intel Microprocessor by Barry B.Brey.
12. Computer architecture and organization by Rifiqzaman and Chandra.
13. Computer Organization J.P. Hays TMH

14. The Pentium Microprocessor by James Antonakos(PEA)
15. The Intel Microprocessor by Barry.B.Brey
16. Digital design : M. Morris Mano, Prentice-Hall of India

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S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER – III

CS-36 : Principles of Communication

Learning outcomes

- To understand basics of communication systems.
- To understand modulation, demodulation and multiplexing of signals.
- To understand digital communication techniques
- To introduce concepts in advanced wireless communication

COURSE CONTENT **4CREDITS(48 L)**

1. Introduction to Electronics Communication (08L)

Importance of Communication, Elements of communication systems, Electromagnetic spectrum, type of communication, Concepts of communication system: channel bandwidth, Nyquist theorem, S/N ratio, channel capacity, error handling, Shannon theorem, concept of companding, Data rate, baud rate, serial communication and protocol.

2. Modulation and Demodulation. (16L)

Introduction to concepts of modulation and demodulation. Modulation techniques: Analog modulation: Amplitude, Phase and Frequency modulation, Circuit diagram and working of transistorized amplitude modulator and diode demodulator. Equation of amplitude modulated wave, modulation index and frequency spectrum.

Digital modulation, PAM, PCM, delta modulation, MODEM – concept of ASK, FSK, QPSK, MSK, GMSK.

3. Multiplexing and Multiple Access Techniques. (12L)

Multiplexing ,Space division multiplexing, Time division multiplexing, Frequency Division Multiplexing, Code division multiplexing, Introduction to multiple access, FDMA, TDMA,CDMA

4. Introduction to wireless and Mobile Communication. (12L)

Introduction to wireless communication system and its concept. Introduction to antennas,working principle and parameters of antenna.Introduction to mobile communication, Cellular concept, Working of GSM: Hand over, Introduction to GPRS, Wi-Fi and blue tooth Applications. Introduction to RFID, Zigbee.

Recommended Books:

6. Digital and Data Communication, 4th edition by Micheal A. Miller.
7. Communication Electronics by Frenezel Louis E.
8. Wireless Communication, 2nd edition. Rappaport.
9. Mobile Communication. Schiller Jochen.
10. Wireless Communications and Networks. William Stallings

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S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER-III

CSIII- LIII: Lab Course on Electronics -III

2 Credits

Learning outcomes

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

- Examination will be conducted on 8 experiments .

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

(Note : Any 8 experiments should be performed)

15. Study of SMPS.
16. Study of 8038 function generators.
17. .DC motor drive and speed control.
18. I-V characteristics temperature sensor AD 590.
19. Analog multiplexers.
20. Analog to Digital converter using discrete components/IC LM 234/74148 or IC 7109/Flash ADC
21. Digital to Analog converter using discrete components.
22. Comparison of Monostable using IC-741 and IC-74121.
23. Simple assembly language program : addition,subtraction
24. Simple assembly language program: multiplication, division
25. Simple assembly language program to find smallest and largest number.
26. LM-35 based temperature sensing system/Optocoupler /opto-isolator base system.
27. Low Pass Filter and High Pass Filter using IC-741 Op Amp.
28. Build and test Hamming Code generator and detector circuit Thumbwheel to seven segment display

S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER-IV

CS- 45 : 8051 MICROCONTROLLER

Learning outcomes

- To study the basics of 8051 microcontroller
- To study the Programming and interfacing techniques of 8051
- To apply knowledge of 8051 to design different application circuits
- To introduce the basic concepts of advanced Microcontrollers

COURSE CONTENT
4CREDITS(48 L)

1. Introduction to 8051 microprocessor [08L]

Introduction to microcontrollers, difference between a microcontroller and microprocessor. Architecture of 8051:Block Diagram of 8051 and Study of Internal Blocks, Pin configuration of 8051,Reset and Clock,Registers, Flags and Internal Memory, SFRS, I/O Ports. Input/Output, Ports, internal memory, External memory.

2. 8051 Instruction Set [12L]

Study of 8051 Instruction Set and Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives .Data transfer, Arithmetic, Logical, JUMP, Loops & CALL instructions, Bit manipulation Instructions.

3. Facilities In 8051 [18L]

Programming 8051 timers, counter programming timer interrupts,
Timer and Counter: Timer and Counters, Timer modes, Programming for time delay in Mode 1 and Mode 2 using assembly and C. Introduction to interrupt ,Interrupt types and their vector addresses. Interrupt enable register and interrupt priority register(IE,IP), Synchronous and asynchronous serial communication , Programming serial port without interrupt, Use of timer to select baud rate for serial communication.

4. Interfacing: [10L]

Interfacing ADC, DAC, LCD, stepper motor.

Recommended Books:

6. "The 8051 Microcontroller and Embedded systems using Assembly and C", by Rolin D.MckinlaySecond Edition. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. by Mckinlay.
7. "The 8051 Microcontroller Architecture, Programming & Application", K.Uma Rao and AndhePallavi, Pearson publications.
8. Programming and customizing the 8051 microcontroller by Myke Predko.
9. ARM System Developers guide: Sloss, Andrew n. Symes.
10. Design with PIC microcontrollers: Peatman, Pearson publications.

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S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER-IV

CS-46 : Analog Systems

COURSE CONTENT **4CREDITS(48 L)**

Learning outcomes

- To understand basics of analog electronics
- To study different types of sensors
- To understand different types of signal conditioning circuits
- To Apply Knowledge Of Analog Systems In Different Applications

1. Measurments, Instrumentation And Calibration [2L]

Measurements, Units, Standards Instrument, instrumentation, Calibration

2. Trancducers And Sensor [10L]

Definition of sensors and transducers. Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensors (LM-35 and AD590), pH sensor, piezoelectric humidity sensor, optical sensor (LDR), displacement sensor (LVDT), Passive Infrared sensor (PIR), tilt sensor, touch sensor, ultrasonic sensor

3. Signal Conditioning [18L]

Principles of signal conditioning, Signal conditioning of passive sensors using bridge circuit:Wheatstone ’s bridge, Level Shifter, Amplifier, Three OP-amp instrumentation amplifier, Filters;active and passive filters. Working principle of Single order Op-Ampbased Low Pass Filter, High Pass Filter, Band Pass Filter, Notch Filter, Band reject filter;Working of Voltage to frequency Converter using OpAmp.

4. Case Study [14L]

Temperature monitoring system using LM35, Water Level Indicator system using float switch, Electrocardiography (ECG).

5. Introduction to Quantum dots, its applications**. [4L]**

Books Recommended

11. Electronic Instrumentation: H. S. Kalsi: TMH: 2nd Ed.
12. Modern Electronic Instrumentation and Measurement Techniques: Albert D.
13. Helfrick, William D. Cooper: PHI publications
14. Electronic measurements : K.A. Bakshi, A. V. Bakshi and U. A. Bakshi, Technical publications. A Course in Electrical and Electronic measurements and Instrumentation: A.K. Sawhney:
15. Dhanpat Rai & Sons Educational & technical publishers
16. Transducers & Instrumentation - Murthy PHI (Unit 1)
17. Instrumentation Measurements & Analysis- Nakra & Chaudhry TMH
18. Instrumentation Devices & Systems - Rangan, Sarma, Mani TMH
19. Sensors & Transducers : Dr. A. D. Shaligram: CTC publications
20. Op-Amps and Linear Integrated Circuits: Ramakant Gaikwad: PHI: 4th Ed.

S.Y.B.Sc. Computer Science(Electronics) CBCS

SEMESTER-IV

CSIV- LIII : Lab Course on Electronics -IV

2Credits

Learning outcomes

- To use basic concepts for building various applications in electronics.
- To understand design procedures of different electronic circuits as per requirement.
- To build experimental setup and test the circuits.
- To develop skills of analyzing test results of given experiments.

- Examination will be conducted on 8 experiments.

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribution of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

(Note : Any 8 experiments should be performed)

20. Absolute decoding and linear select decoding.
21. Temperature to frequency / voltage converter
22. Reed relay control using digital logic
23. Build and test Amplitude Modulator and Demodulator.
24. Build and test Frequency Shift Keying.
25. Build and test TDM.
26. Study of pulse amplitude modulation.
27. Demonstration of working of Wi-fi card.
28. Demonstration Experiment on RFID application.
29. Build and test LDR based light control system.
30. Study of Linear Variable Differential Transformer.
31. Build and test Instrumentation Amplifier.
32. Study of radiation pattern of antenna.
33. 8051 Microcontroller programs:Arithmetic, logical & code conversion problems using assembly/C programming
34. Interfacing the thumbwheel & seven segment display.
35. Traffic light controller using microcontroller.
36. Interfacing LCD to Microcontroller.
37. To study waveform generator (square, triangular and saw tooth using DAC) with microcontroller
38. Study of radiation pattern of antenna.

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S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER – III

CS- 33 : Linear Algebra

COURSE CONTENT **4CREDITS(48 L)**

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in Linear equations and matrices, General vector spaces, Eigen Values and Eigen functions and linear transformation.

At the end of this course student are expected to be able to.

(v) Know linear system, matrix transformtaion, solution of linear systems of equations, and LU decomposition.

(vi) Know the real vector spaces, subspaces, linear independence, basis and dimensions.

(vii) Find linear dependence, linear span, basis and dimension of vector spaces.

(viii) Solve kernel and range of linear transformation..

[1] Linear Equations and Matrices **[12]**

(1.1) Linear systems
(1.2) Matrices
(1.3) Dot Product and Matrix Multiplication
(1.4) Matrix Transformations
(1.5) Solutions of Linear Systems of Equations
(1.6) LU- Factorization.

[2] General Vector Spaces **[12]**

(2.1) Real vector spaces.
(2.2) Subspaces.
(2.3) Linear independence.
(2.4) Basis and dimensions.
(2.5) Row space, column space and null space.
(2.6) Rank and Nullity.

[3] Eigen values and Eigen vectors **[12]**

(3.1) Eigen values and Eigen vectors.
(3.2) Diagonalization.
(3.3) Quadratic forms.
(3.4) Using scilab : (i)Find Eigen values and Eigen vectors.
(ii) Diagonalization

[4] Linear Transformations **[12]**

(4.1) General linear transformations.
(4.2) Kernel and range. (Rank nullity theorem without proof.)
(4.3) Inverse linear transformation.
(4.4) Matrix of general linear transformation.

TEXT BOOKS:

(7) S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Nirali Prakashan
(8) S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Vision Publication
(9) F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Nirali Prakashan
(10) F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Vision Publication
(11) Elementary Linear Algebra (Applications Version) by Howard Anton, Chris Rorres. (Seventh Edition) John Wiley & Sons, Inc.
Sections: 5.1 to 5.6, 7.1, 7.2, 9.5, 9.6, 8.1 to 8.4
(12) Discrete Mathematical Structures (sixth edition), Kolman, Busby and Ross. PHI.
Sections: 9.5, 11.1 to 11.3

REFRENCE BOOKS:

(1) M. Artin, Algebra, Prentice Hall of India , New Delhi, (1994).
(2) K. Hoffmann and R. Kunze Linear Algebra, Second Ed. Prentice Hall of India New Delhi, (1998).
(3) S. Lang, Introduction to Linear Algebra, Second Ed. Springer-Verlag, New Yark, (1986).
(4) A. Ramchandra Rao and P. Bhimasankaran, Linear Algebra, Tata mcgraw Hill, New Delhi (1994).
(5) G. Strang, Linear Algebra and its Applications. Third Ed. Harcourt Brace Jovanovich, Orlando, (1988).

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S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER-III

CS- 34 : COMPUTER ORIENTED NUMERICAL METHODS

COURSE CONTENT **4CREDITS(48 L)**

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in PERT and CPM, solution of non linear equation, polynomial interpolation, numerical differentiation and integration solution of ODE and simultaneous linear equation.

At the end of this course student are expected to be able to.

(vi) Know forward and backward pass computation slack, critical path of PERT and CPM terms.

(vii) Solve non linear equation by using bisection, secant , regula- falsi, Newton- Raphson methods .

(viii) Create a polynomial by using Newton's backward and forward formulae, Lagrange's interpolation formulae, Hermite interpolation.

(ix) Solve integration by using Bisection, Secant, Regula-Falsi and Newton-Raphson methods

(x) Solve differential equation examples on Euler's method, Runge-Kutta second and fourth Order formula.

[1] PERT and CPM Computations [10]

(1.1) Phases of project schedulding

(1.2) Network logic , numbering the events (Fukerson's rule.)

(1.3) Measure of activity

(1.4) PERT: forward and backwad pass computations slack , critical path.

(1.5) CPM terms, critical path, float.

(1.6) Using scilab

i. Use of ' deff ' command for one and two variables functions.

ii. Draw 2-D and 3-D graph for some standard functions.

E.g. x^2 , sin (x), exp(x), x^3+y^3 etc .

[2] Solutions of Non – linear Equations [10]

(2.1) Location of Roots

(2.2) Bisection, Secant, Regula-Falsi and Newton-Raphson methods, Comparison Of these methods

(2.3) Acceleration of convergence Aitken's Process

(2.4) Regula-Falsi method and Newton-Raphson method using Scilab.

[3] Polynomial Interpolation & Approximation [10]

(3.1) Finite differences: Forward, Backward and Central

(3.2) Detection of errors using different tables

(3.3) Newton's backward and forward formulae for interpolation

(3.4) Lagrange's interpolation formulae for unequal intervals

(3.5) Least square approximation by Polynomials up to third degree

(3.6) Hermite Interpolation.

(3.7) Newton Forward, Newton Backward and Lagrange's Interpolation by using Scilab

[4] Numerical Differentiation and Integration [10]

(4.1) Numerical differentiation using interpolating polynomials

(4.2) Trapezoidal rule, Simpson's (1/ 3)rd rule and Simpson's (3/8)th rule

(4.3) Extrapolation to the limit : Ramberg Interpolation

(4.4) Numerical integration by Simpson's (1/3)rd, numerical integration by Simpson's (3/8)th rule, rule by using Scilab

[5] Solution of Ordinary Differential Equations &solution of Simultaneous Linear Equations **[08]**

(5.1) Numerical Integration By Tayler Series
(5.2) Euler's method
(5.3) Runge-Kutta method: 2^{nd} and 4^{th} orders
(5.4) Predictor corrector method
(5.5) Gaussian Elimination, Pivoting Strategy, Conditional Equations
(5.6) Modification of Gaussian Elimination to Compute Inverse of Matrix
(5.7) Comparison of direct and iterative methods
(5.8) Examples on Euler's method, Runge-Kutta second and fourth order formula by using Scilab.

Text Books :

Prof S.R.Patil; Prof S.G.Gujrathi; Prof D.M. Pandhare;
Numerical Methods And Operation Research; Nirali Prakashan,1998.

Reference Books:

1.S.S.Sastry; Introductory methods of Numerical Analysis ; Prentice-Hall of India (3^{rd} edition) 2000
2. J.H.Mathews; Numerical methods for Mathematics, Science and Engineering (2^{nd} edition); Prentice-Hall of India ,1994.
3. R.J. Dromey; How To Solve It By Computer; Prentice-Hall Of India; 1982
4. Anthony Ralston,Philip Rabinowitz; A First Course in Numerical Analysis; (2^{nd} edition) International Student edition; mcgraw-Hill Book Company; TOKYO; 1978
5. Computer Oriented Numerical Methods-Rajaraman.
6. Introduction To Numerical Analysis-C.E. Froberg.
7. Introduction To Applied Numerical Analysis-C.E.Froberg.
8. Numerical Methods that works-Forman S. Action.
9.Numerical Methods in Fortran-J.M.Mcormik.
10. Numerical Methods For SC & Engg - R.G.Stanton (Prentice Hall)

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S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER-IV

CS- 43 : COMPUTATIONAL GEOMETRY

COURSE CONTENT

4CREDITS(48 L)

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in Two dimensional transformations, Three dimensional transformations, plane curves, space curves.

At the end of this course student are expected to be able to.

(v) Know representation of points, lines, transformation and matrices, various type of transformation.

(vi) Solve multiple transformation and projection of 3 dimensional .

(vii) Find equidistance points on ellipse, circle, parabola, hyperbola.

(viii) Know the introduction and properties of Beizer curve, and B-spline curve.

[1] Two Dimensional Transformations **[12]**

(1.1) Introduction

(1.2) Representation of points
(1.3)Transformation and matrices
(1.4) Transformation of points
(1.5) Transformation of straight line
(1.6) Midpoint transformation
(1.7) Transformation of parallel lines
(1.8) Transformation of intersecting lines
(1.9) Transformations: rotation, reflection, scaling, shearing
(1.10) Concatenated transformations
(1.11) Transformation of a unit square
(1.12) Solid body transformations
(1.13) Translations and homogeneous coordinates
(1.14) Rotation about an arbitrary point
(1.15) Reflection through an arbitrary line
(1.16) Overall scaling , point at infinity
(1.17) Projection – a geometric interpretation of homogeneous cordinates

[2] Three Dimentional Transformations [12]

(2.1) Introduction

(2.2) Three Dimentional-Scaling, Shearing , Reflection, Translation,Rotation

(2.3) Multiple Transformation

(2.4) Rotation About - an axis parallel to a coordinate axis, an arbitrary axis in space

(2.5) Reflection through an arbitrary plane.

(2.6) Affine and Perspective Geometry.

(2.7) Orthographic Projections.

(2.8) Axonometric Projections.

(2.9) Oblique Projections

(2.10) Single Point Perspective Transformations.

(2.11) Vanishing Points

[3] Plane Curves [12]

(3.1) Introduction

(3.2) Curve representation

(3.3) Non-parametric curves.

(3.4) Parametric curves.

(3.5) Parametric representation of circle.

(3.6) Parametric representation of ellipse.

(3.7) Parametric representation of parabola.

(3.8) Parametric representation of hyperbola

[4] Space Curves [12]

(4.1) Beizer Curves –Introduction , Definition, Properties (without proof), Curve Fitting (Upto n=3), Equation of Curves in Matrix form (upto n=3)

(4.2) B-Spline Curve-Introduction ,Definition, Properties (without proof)

TEXT BOOKS:

8. S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Nirali Prakashan
9. S.Y.B.Sc. (Computer Science) Sem.-I, Paper-I Linear Algebra, Vision Publication
10. S.Y.B.Sc. (Computer Science) Sem.-II, Paper-I, Computational Geometry, Nirali Prakashan
11. S.Y.B.Sc. (Computer Science) Sem.-II, Paper-I, Computational Geometry, Vision Publication
12. F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Nirali Prakashan
13. F.Y.B.Sc.. (Computer Science) Geometry and Calculus, Vision Publication
14. D. F. Rogers, J. A. Adams, Mathematical elements for Computer graphics, Mc Graw Hill Intnl Edition.

REFRENCE BOOKS:

(1) G.S. Pandey And R.R.Sharma; Vector and Geometry ; Wishwa Prakashan

(2) P. Balsubrahamanyam, K.G. Balsubrahamanyam, G.R.Venkataraman;

Coordinate Geometry of two and three Dimensions; Tata mcgraw-HILL, New Delhi

(3) David F. Rogers, J Alan Adams; Mathematical Elements for Computer Graphics (Second Edition); mcgraw-HILL International Editions.1990

(4) William M. Newman, Robert F. Sproul; Principles of Interactive computer Graphics (Second Edition); International Student Edition, Mcgraw-Hill Book company, Tokyo. 1979.

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S.Y.B.Sc. COMPUTER SCIENCE (MATHEMATICS)

SEMESTER – IV

CS – 44 : OPTIMIZATION TECHNIQUES

COURSE CONTENT

4CREDITS(48 L)

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in linear programming, transportation problem, assignment problem and game theory.

At the end of this course student are expected to be able to.

(ix) Know formulation, graphical method and simplex method, duality of L.P.P.

(x) To find the initial basic feasible solution and optimal solution by using North-West corner method, Least cost method, VAM method, MODI method of a transportation problem.

(xi) To find initial optimal solution by using Hungarian method, with their types.

(xii)Solve the game by using graphical method, dominance method.

[1] Linear Programming :- **[12]**

(1.1) Advantages, Limitations, Definitions, Terminology, Formulation of L.P.P.

(1.2) Solution by Graphical Method & Simplex Method, special Cases

(1.3) Duality – concept, Interrelation between a Primal and Dual, Advantages, Interpretation of dual

(1.4) Solution of L. P. P. by simplex method (verification by TORA **)**

[2] Transportation Problems :- **[12]**

(2.1) Introduction, General structure of transportation problem

(2.2) Unbalanced transportation problem

(2.3) North-West Corner Method, Least Cost Method, Vogel's Approximation Method

(2.4) MODI Method

(2.5) Degeneracy in transportation problem

(2.6) Maximization in transportation problem

(2.7) Prohibited transportation problem

(2.8) Numerical problems

(2.9) Transportation problem (verification by TORA)

[3] Assignment Problems :- **[12]**

(3.1) Statement and mathematical representation of assignment problem
(3.2) Unbalanced assignment problem
(3.3) Hungarian method of solving A.P. (Minimization Case)
(3.4) Maximization assignment problem
(3.5) Multiple assignment problem
(3.6) Prohibited assignment problem
(3.7) Numerical problems
(3.8) Assignment problem (verification by TORA)

[4] Theory of games **[12]**

(4.1) Two persons zero sum game, pure and mixed strategies, statement of The mini-max theorem
(4.2) Graphical method for solving 2xm principles and dominance and Nx2 games and solving some simple games

(4.3) Connection between the game problem and L. P. P., Simple games

Text Books :

Prof S.R.Patil; Prof S.G.Gujrathi; Prof D.M. Pandhare;
Numerical Methods And Operation Research; Nirali Prakashan,1998.

Reference Books:

1.

1. R.J. Dromey; How To Solve It By Computer; Prentice-Hall Of India; 1982
2. V.K.Kapoor; Operations Research; Sultan Chand & Sons Educational Publishers, New Delhi; 1985.
3. S.D.Sharma; Operations Research;Kedar Nath Ram Nath & Co. Publishers, Meerut, 1972.
5 L.C. Jhambh; Quantitative Techniques Vol I & II; Everest Publishing House, Pune-1998.
5. N.D. Vohra; Quantitative Techniques in Management (Second Edition); Tata mcgraw-Hill Publishing Company Limited New Delhi; 1990.
6. Kanti Swarup, P.K.Gupta, Man Mohan; Operations Research; Sultan Chand & Sons Educational Publishers, New Delhi, 1977.
9. P.K.Gupta, D.S.Hira; Operations Research ; S.Chand & Company Ltd, New Delhi. 1979.
10. N.Paul Loomba; Linear Programming TMH Edition; Tata mcgraw-Hill Publishing Company Limited, New Delhi, 1971.

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