ROYAL GLOBAL UNIVERSITY
GUWAHATI

Royal School of Engineering and Technology (RSET)

Department of Computer Science and Engineering (CSE)

Learning Outcome-based Curriculum Framework for

Undergraduate Programme in B. Tech (CSE)

W.E.F 2022-23

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1. PREAMBLE

The curriculum of B.Tech. Computer Science and Engineering program offered by the Department of Computer Science and Engineering under the Royal School of Engineering and Technology, RGU, is prepared in accordance with the learning outcomes-based curriculum framework of AICTE. Further this LOCF framework is designed with Choice Based Credit and Semester System (CBCSS) enabling the learners to gain professional competency with multi-disciplinary approach catering the minimum requirement (Program Specific Criteria) of Lead Societies like ACM and other Professional Bodies as per the Engineering Accreditation Commission (EAC) of ABET and NBA. In addition, the curriculum and syllabi are designed in a structured approach by deploying Feedback Mechanism on Curriculum from various stakeholders viz. Industry, Potential Employers, Alumni, Academia, Professional Bodies, Research Organizations and Parents to capture their voice of the respective stakeholders. The Curriculum design, delivery, and assessment, the three major pillars of academic system are completely aligned in line with Outcome Based Education (OBE) to assess and evaluate the learning outcomes to facilitate the learners to achieve their Professional and Career Accomplishments.

2. INTRODUCTION

Computer Science (CS) has been evolving as an important branch of science and engineering throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms.The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain.

B. Tech. in Computer Science and Engineering (CSE) is an academic programme of the duration of four years which integrates the field of Computer Science and Computer Engineering. The programme primarily lays emphasis on the basics of computer programming and networking while also comprising a plethora of topics. Students who pursue the course of Computer Science Engineering are taught about design, the implementation as well as management of computer software and hardware. Once the course is completed, computer science engineers are engaged in many aspects of computing, ranging from the design of individual microprocessors, supercomputers, and personal computers to designing the circuit and creating software that powers them. The students are taught to understand, learn and use the different programming languages, networking and telecommunications, digital and analogue electronics, etc.

3. LEARNING OUTCOME BASED APPROACH TO CURRICULUM PLANNING

The Learning Outcome-based Curriculum Framework in Computer Science is aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in computer science courses, in outcome-based curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages.

The present Learning Outcome-based Curriculum Framework for bachelor's degrees in CS is intended to facilitate the students to achieve the following:

- To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.
- To develop the ability to use this knowledge to analyse new situations

- To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
- The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems.
- To learn skills and tools like mathematics, statistics, physics and electronics to find the solution, interpret the results and make predictions for the future developments

4. VISION

To achieve excellence in engineering education and research by imparting personal, technical, entrepreneurial, research and managerial skills in through computer science and engineering programs through strong applied mathematics, electronics and computer engineering foundation.

5. MISSION

- To educate the students to gain an understanding of the fundamentals of core and allied disciplines so that they can enhance their skills in the areas of Computer Science and Engineering and develop solutions to potential problems.
- To impart the importance of teamwork, independent & innovative thinking and leadership qualities.
- To inculcate in the students the attitudes and values that will prepare them for lifelong learning
- To generate new knowledge and technology for the benefit of the society through quality research and projects

6. GRADUATE ATTRIBUTES

Graduate attributes are the high-level qualities, skills and understandings that a student should gain as a result of the learning and experiences they engage with, while at university. This 'graduateness' is what sets them apart from those without a degree, and is the added value which graduates can enjoy and share with employers and the wider community. They equip students and graduates for lifelong personal development, learning and to be successful in society. There are 12 such identified attributes which are as follows:

- ***GA1:(KB) A knowledge base for engineering:*** Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
- ***GA2: (PA) Problem analysis:*** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions
- ***GA3: (Inv.) Investigation:*** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
- ***GA4: (Des.) Design:***An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
- ***GA5: (Tools) Use of engineering tools:***An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
- ***GA6: (Team) Individual and teamwork:***An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
- ***GA7: (Comm.) Communication skills:***An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.

- ***GA8: (Prof.) Professionalism:***An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
- ***GA9: (Impacts) Impact of engineering on society and the environment:***An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
- ***GA10: (Ethics) Ethics and equity:***An ability to apply professional ethics, accountability, and equity.
- ***GA11: (Econ.) Economics and project management:***An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
- ***GA12: (LL) Life-long learning:***An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

7. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Programme Educational Objectives (PEOs) are defined and developed for each program with the consultation and involvement of various stakeholders such as management, students, industry, regulating authorities, alumni, faculty and parents. Their interests, social relevance and contributions are taken in to account in defining and developing the PEOs. The Program Educational Objectives (PEOs) of the Computer Science and Engineering are listed below:

- **PEO1:** To provide students with a strong foundation in the Mathematical, Scientific and Engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D.
- **PEO2:** To provide exposure to emerging cutting-edge technologies, adequate training & opportunities to work as teams on multidisciplinary projects with effective communication skills and leadership qualities.
- **PEO3:**To prepare the students for a successful career for bridging the digital divide and meeting the requirements of Indian and multinational companies.
- **PEO4:** To promote student awareness on life-long learning and to introduce them to professional ethics and codes of professional practice.

8. PROGRAMME OUTCOMES (POs)

Programme Outcomes describe what students are expected to know or be able to do by the time of graduation from the CSE programme. POs are statements about the knowledge, skills and attitudes (attributes) the graduate of a formal engineering program should have. POs deal with the general aspect of graduation for a particular program, and the competencies and expertise a graduate will possess after completion of the program. The identified Pos are as follows:

- **PO1 - Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2 - Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3 - Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

- **PO4 - Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5 - Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO6 - The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7 - Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8 - Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9 - Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10 - Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11 - Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12 - Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

9. PROGRAMME SPECIFIC OUTCOMES

- **PSO1:**Able to apply the knowledge of programming languages, data structures and Algorithms, data science, networks and software engineering principles for software product development.
- **PSO2:**Able to analyze and formulate solutions to real world and socially relevant problems over multi disciplinary domains by using latest technologies.
- **PSO3:**Able to be a technically competent employee, researcher, entrepreneur, excel in competitive exams and zest for higher studies.

10. CREDIT DISTRIBUTION AND GENERAL STRUCTURE

a. Definition of Credit

1 Hour Lecture (L) per Week	1 Credit
1 Hour Tutorial (T) per Week	1 Credit
2 Hours Practical (P) per Week	1 Credit

b. Range of Credits

A student will be eligible to get B. Tech degree in Computer Science and Engineering if he/she earns total credit of 166. A student will be eligible to get the degree with Honors, if he/she completes an additional 20 credits. These could be acquired through MOOCs or SWAYAM platforms.

c. Structure of Undergraduate Engineering Program

Sl. No	*Category*	*Credit Breakup*
1	Humanities and Social Sciences including Management courses	14
2	Basic Science courses	24
3	Engineering Science courses including workshop, drawing,	24

	basics of electrical/mechanical/computer etc	
4	Professional core courses	60
5	Professional Elective courses relevant to chosen specialization/branch	12
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	14
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	06
	Total	**166**

d. Semester-wise Credit Distribution

SEMESTER	CREDITS
I	**17**
II	**19**
III	**23**
IV	**20**
V	**21**
VI	**23**
VII	**23**
VIII	**20**
Total	**166 credits**

11. Teaching Learning Process

	Component of Evaluation	Marks	Frequency	Code	Weightage (%)
A	**Continuous Evaluation**				
I	Analysis/Class test	Combination of any three from (i) to (v) with 5 marks each	1-3	C	25%
Ii	Home Assignment		1-3	H	
Iii	Project		1	P	
Iv	Seminar		1-2	S	
V	Viva-Voce/Presentation		1-2	V	
Vi	MSE	MSE shall be of 10 marks	1-3	Q/CT	
Vii	Attendance	Attendance shall be of 5 marks	100%	A	5%
B	Semester End Examination		1	SEE	70%
	Project				**100%**

12. COURSE STRUCTURE

B.TECH (CSE-REGULAR)

Programme Structure

1st semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(3+4+1+3+3+1+1+1=17 credits)							
Core Courses (CC)							
1	CHY022C101	Chemistry	3	0	0	3	3
2	MAT022C102	Mathematics – I	3	1	0	4	4
3	CHY022C111	Chemistry Lab	0	0	2	1	2
4	CEE022C117	Engineering Graphics & Design	1	0	4	3	5
5	MEE022C118	Workshop Practices	1	0	4	3	5
Ability Enhancement Compulsory Courses (AECC)							
1	CEN982A101	Developing Oral Communication and Listening Skills	1	0	0	1	1
2	EVS982A103	Environmental Sciences-I	1	0	0	1	1
3	BHS982A104	Concepts of Behavioural Science	1	0	0	1	1
		TOTAL	**11**	**1**	**10**	**17**	**22**

2nd semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(3+4+3+3+1+1+1+1+1+1=19 credits)							
Core Courses (CC)							
1	PHY022C201	Physics	3	0	0	3	3
2	MAT022C202	Mathematics – II	3	1	0	4	4
3	ELE022C203	Basic Electrical Engineering	3	0	0	3	3
4	CSE022C204	Programming for Problem Solving	3	0	0	3	3
5	PHY022C211	Physics Lab	0	0	2	1	2
6	ELE022C213	Basic Electrical Engineering Lab	0	0	2	1	2
7	CSE022C214	Programming for Problem Solving Lab	0	0	2	1	2
Ability Enhancement Compulsory Courses (AECC)							
1	CEN982A201	Conversation and Public Speaking	1	0	0	1	1
2	EVS982A203	Environmental Sciences-II	1	0	0	1	1
3	BHS982A204	Understanding Self and Others	1	0	0	1	1
		TOTAL	**15**	**1**	**6**	**19**	**22**

3rd semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(4+4+3+4+3+2+2+1=23 credits)							
Core Courses (CC)							
1	MAT022C301	Mathematics-III	3	1	0	4	4
2	MAT022C302	Discrete Mathematics	3	1	0	4	4
3	CSE022C303	Data Structure & Algorithms	3	0	0	3	3
4	CSE022C304	Computer Organization and Architecture	3	1	0	4	4
5	ECE022C307	Digital Logic and System Design	3	0	0	3	3
6	CSE022C313	Data Structure & Algorithms Lab	0	0	4	2	4
7	ECE022C317	Digital Logic and System Design Lab	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
1	CEN982A301	Career Oriented Communication	1	0	0	1	1
		TOTAL	**16**	**3**	**8**	**23**	**27**
4th Semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(3+3+3+3+3+2+2+1=20 credits)							
Core Courses (CC)							
1	CSE022C401	Computer Graphics	3	0	0	3	3
2	CSE022C402	OOP using C++	3	0	0	3	3
3	CSE022C403	Database Management Systems	3	0	0	3	3
4	CSE022C404	Finite Language & Automata	3	0	0	3	3
5	BSA022C401	Principles of Management and Organizational Behavior	3	0	0	3	3
6	CSE022C412	OOP using C++ Lab	0	0	4	2	4
7	CSE022C413	Database Management Systems Lab	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
1	CEN982A401	Communication and Presentation Skills	1	0	0	1	1
		TOTAL	**16**	**0**	**8**	**20**	**24**
5th semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(3+3+3+3+3+1+1+2+2=21 credits)							
Core Courses (CC)							
1	CSE022C501	Operating Systems	3	0	0	3	3
2	CSE022C502	Software Engineering	3	0	0	3	3

3	CSE022C503	Principle of Programming Languages	3	0	0	3	3
4	CSE022C504	Graph Theory	3	0	0	3	3
5	POL022C503	Constitution of India	1	0	0	1	1
6	CSE022C511	Operating Systems Lab	0	0	4	2	4
7	CSE022C513	Principle of Programming Languages Lab	0	0	4	2	4
Generic Elective (GE)							
1	CSE022G505	Other School Open Elective –I	3	0	0	3	3
Ability Enhancement Compulsory Courses (AECC)							
1	CEN982A501	Ethics and Business Communication	1	0	0	1	1
		TOTAL	**17**	**0**	**8**	**21**	**25**
6th Semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(3+3+3+3+3+2+2+3+1=23 credits)							
Core Courses (CC)							
1	CSE022C601	Data Communication and Networks	3	0	0	3	3
2	CSE022C602	Design & Analysis of Algorithms	3	0	0	3	3
3	CSE022C603	Compiler Design	3	0	0	3	3
4	ECE022C609	Microprocessor	3	0	0	3	3
5	COM022C601	Economics & Accountancy	3	0	0	3	3
6	CSE022C611	Data Communication and Networks Lab	0	0	4	2	4
7	ECE022C619	Microprocessor Lab	0	0	4	2	4
Generic Elective (GE)							
1	XXX022G605	Other School Open Elective-II	3	0	0	3	3
Ability Enhancement Compulsory Courses (AECC)							
1	CEN982A601	Effective Workplace Communication	1	0	0	1	1
		TOTAL	**19**	**0**	**8**	**23**	**27**
7th semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(3+3+2+3+3+3+2+4=23 credits)							
Core Courses (CC)							
1	CSE022C701	Web Technology	3	0	0	3	3
2	CSE022C702	Artificial Intelligence	3	0	0	3	3
3	CSE022C711	Web Technology Lab	0	0	4	2	4

Discipline Specific Elective (DSE)							
1	CSE022D70X	Elective-I	3	0	0	3	3
2	CSE022D70X	Elective-II	3	0	0	3	3
Generic Elective (GE)							
1	CSE022G70X	RSET Open Elective-I	3	0	0	3	3
		Summer Training					
1	CSE022C736	Summer Training	0	0	0	2	0
Project Dissertation							
1	CSE022C727	Project-I	0	0	8	4	8
		TOTAL	**15**	**0**	**12**	**23**	**27**
8th Semester							
S. No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
(3+2+3+3+3+6=20 credits)							
Core Courses (CC)							
1	CSE022C801	Cryptography and Network Security	3	0	0	3	3
2	CSE022C846	Comprehensive Viva	0	0	0	2	0
Discipline Specific Elective (DSE)							
1	CSE022D80X	Elective-III	3	0	0	3	3
2	CSE022D80X	Elective-IV	3	0	0	3	3
Generic Elective (GE)							
1	CSE022G803	RSET Open Elective-II	3	0	0	3	3
Project Dissertation							
1	CSE022C825	Project–II	0	0	12	6	12
		TOTAL	**12**	**0**	**12**	**20**	**24**

TOTAL CREDITS = 166

LIST OF DEPARTMENT SPECIFIC ELECTIVES			
Elective No	**Sl. No**	**Subject Code**	**Name of the Elective**
I	1	CSE022D701	Mobile Computing
	2	CSE022D702	Natural Language Processing
	3	CSE022D703	VLSI Design
II	1	CSE022D704	Big Data Analytics
	2	CSE022D705	Artificial Intelligence
	3	CSE022D706	Optical Fiber Communication

III	1	CSE022D801	Digital Image Processing
	2	CSE022D807	Neural Networks and Fuzzy Logic
	3	CSE022D803	Embedded Systems
	4	CSE022D804	Bioinformatics
IV	1	CSE022D805	Wireless Computing
	2	CSE022D806	Computer Vision
	3	CSE022D807	Expert System
	4	CSE022D802	Recent Trends in Computer Science

LIST OF OTHER SCHOOL OPEN ELECTIVES OFFERED BY CSE DEPARTMENT			
Sl. No	**Semester**	**Subject Code**	**Name of the Elective**
1	5th	CSE022G505	Social Media Studies
2	6th	CSE022G606	Open Source Software

LIST OF RSET OPEN ELECTIVES OFFERED BY CSE DEPARTMENT			
Sl. No	**Semester**	**Subject Code**	**Name of the Elective**
1	7th	CSE022G705	Internet Technology
2	8th	CSE022G803	Fundamentals of IOT

*****The list of Electives may vary from the following depending upon the recent trends, availability of faculty, resources, etc.**

13. DETAILED SYLLABUS OF 1ST SEMESTER

Paper I/Subject Name: Chemistry		**Subject Code: CHY022C101**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are toenable the students to apply to empower the students to analyse major chemical reactions that are used in the synthesis of molecules and to understand the chemistry of various fuels and their combustion

Prerequisites: Concepts of +2 level Chemistry

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Describe** and **understand** the ideas in thermodynamics, electrochemistry and their importance in engineering	**BT 2**
CO 2	**Develop** an ability to design, implement, and evaluate the results of experimentation using standard scientific methodologies such as	**BT 3**
CO 3	**Analyze** the combustion mechanisms of various fuels	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Content	Periods
I.	**Thermodynamics and Kinetics**	T**hermodynamics**: First law of thermodynamics and its limitations, heat capacity and relation between C_p &C_v, Second law, Carnot theorem, entropy, entropy change for an ideal gas, free energy and work function: Helmholtz and Gibbs free energy, criteria of spontaneity, Gibbs-Helmholtz equation, Clausius-Clapeyron equation, Gibbs-Duhem equation, chemical potential. **Kinetics**: Reaction rate, factors influencing the rate of a reaction, rate law, order and molecularity of a reaction, differential and integrated form of rate expressions for zero and first order reactions, half-life period, effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy, consecutive, concurrent and opposing reactions.	**9**
II.	**Electrochemistry and Corrosion**	Electrochemical cells, electrode potential and cell potential (EMF), representation of a cell, electrochemical series and its application. Nernst's equation, numericals on electrode and cell potentials, reference electrodes (H_2 electrode, calomel electrode), glass electrode, concentration cell. Batteries: its classification, Lead – acid battery, Ni – Cd battery, alkaline battery, wind energy, fuel cell, solar cell. Corrosion, causes and effects, mechanism of dry and electrochemical corrosion, differential aeration corrosion, types of corrosion (including waterline, pitting, soil), passivity, corrosion control; proper designing, protective coating, use of inhibitors.	**9**

III.	**Chemical Bonding and Crystal Structure**	**Molecular orbital theory:** Bonding and antibonding MOs, HOMO, LUMO, energy level diagrams for homonuclear and heteronuclear diatomic molecules; explanations of bond order, binding energy and magnetic property. **Co-ordination compounds**: Bonding in transition metal complexes, valence bond theory and crystal field theory, colour, geometry and magnetic properties of co-ordination complexes on the basis of VBT and CFT. **Crystal Structure**:Crystal planes and Miller indices. X-ray diffraction and Bragg's law. Born-Lande equation of lattice energy. Close packing of atoms and packing efficiency, octahedral and tetrahedral holes. Radius ratio rules.	**9**
IV.	**Modern Engineering Materials**	**Nanomaterials:** Introduction, differences from other materials, Properties of nanomaterials, one, two and 3D nanomaterials, preparation of nanomaterials (top down and bottom up approach), applications of nanomaterials. **Cement**: Definition, composition, basic constituents, chemistry of setting and hardening of cement and role of gypsum, manufacture of Portland cement **Liquid Crystal**: Definition, classification, mesomorphic phases: thermotropic and lyotropic; smectic, nematic and cholesteric liquid crystals: chemical constituents and liquid crystalline behavior, uses of liquid crystals **Polymers**: Monomer, oligomer and polymer, types of polymerization, molecular weight of polymers, preparation and property of some important polymers: cellulose derivatives, polythene, PVC, PTFE, polyamide and phenolic resins, conducting polymers.	**9**
		TOTAL	**36**

Text Books

1. *A Textbook of Physical Chemistry*, Negi A.S. and Anand S.C., 2nd Edition, 2007, New Age International
2. *Concise Inorganic Chemistry,* Lee J.D., 5th Edition, 2008, John Wiley and Sons Ltd.

Reference Books:

1. Atkins, P.W. and Paula, J. De,*Physical Chemistry,* 10th Edition, 2014, Oxford University Press
2. Huheey, J.E. Keiter, E.A. Keiter, R.L Medhi, O.K.,*Inorganic Chemistry Principles of Structure and Reactivity*, 4th Edition, 2006, Pearson Education

Paper II/Subject Name: Mathematics-I		Subject Code: MAT022C102
L-T-P-C – 3-1-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are to enable students to learn the fundamental concepts of single and multivariable differential and integral calculus.

Prerequisites: Concepts of Mathematics of +2 level

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the applications of differential and integral calculus in different fields of Engineering.	**BT 2**
CO 2	**Apply** the single and multivariable differential and Integral calculus in engineering problems.	**BT 3**
CO 3	**Analyse** and assess basis and dimension of vector spaces and their applications.	**BT 4& 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I.	**Single Variable Calculus:**	Rolle's theorem, Mean value theorem (only statement and problem), Successive Differentiation, Leibnitz theorem, Taylor's and Maclaurin's Series, expansion of function. Jacobians and their applications (for two and three variables), Errors and Approximations. Reduction formula, concept of curve tracing. some important curves,area under Plane curves , volume and surface area of solids of revolution of plane curves.	**12**
II.	**Multi Variable Calculus:**	Partial Derivatives, Euler's theorem on homogeneous function (statement & Application), Total derivatives. Differentiation under integral sign (Leibniz's rule), multiple integrals	**12**
III.	**Application Of Calculus**	Maxima and Minima of Functions of two and three variables, Lagrange's method of undetermined multipliers. Area and Volume by double and triple integrals, Beta and Gamma functions.	**12**
IV	**Linear Algebra**	Definitions and properties of (symmetric, skew-symmetric, Hermitian, skew-Hermitian, idempotent, nilpotent, involuntary, orthogonal, unitary). Computation of inverse by elementary transformations, reduction of matrices to Echelon form and normal form; rank of a matrix ; Consistency of a system of linear equations; solution of a system of linear equations (Cramer's rule, Gauss elimination method).	**12**

		Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem, Reduction of a matrix to diagonal form, diagonalization.	
			TOTAL **48**

Text Books:

1. *A text book of Engineering Mathematics*, Bali N. P. and Narayan Iyenger N., 9th Edition, 2016, Laxmi Publication.
2. *Mathematical Methods for Physics and Engineering: A Comprehensive Guide,* K. F. Riley, M. P. Hobson, 3rd Edition, 2006, Cambridge University Press

Reference Books:

1. Grewal B. S., *Higher Engineering Mathematics*, 43rd Edition, 2014, Khanna Publishers.
2. Das B. C. & Mukherjee B. N., *Differential Calculus*, 55th Edition, U. N. Dhur& Sons Pvt. Ltd.
3. Das B. C. & Mukherjee B. N, *Integral Calculus*, 57th Edition, U. N. Dhur& Sons Pvt. Ltd

Paper III/Subject Name: Chemistry Lab		Subject Code: CHY022C111
L-T-P-C – 0-0-2-1	Credit Units: 01	Scheme of Evaluation: P

Objective:

The objectives of the course are to make the students understand the basics of fundamental phenomenon of Chemistry and application in engineering & technology

Prerequisites: Concepts of Chemistry of +2 level

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** basic techniques used in chemistry laboratory for small/large scale analyses/purification.	**BT 2**
CO 2	**Utilize** the fundamental laboratory techniques for analyses such as titrations, separation/purification, etc.	**BT 3**

Detailed Syllabus:

- Estimation of Ferrous Iron, Fe (II) using potassium permanganate solution.
- To determine the total hardness, calcium hardness and magnesium hardness of water.
- To determine the strength of the given glucose solution by titrating with Fehling's solution.
- Preparation of tetramminecopper(II)sulphate, [Cu(NH3)4]SO4.H2O

Text Books

1. *A Textbook of Physical Chemistry*, Negi , A.S. and Anand, S.C., 2nd Edition, *2007*, New Age International
2. *Concise Inorganic Chemistry,* Lee, J.D., 5th Edition, 2008, John Wiley and Sons Ltd.

Reference Books:

1. Atkins, P.W. and Paula, J. de, *Physical Chemistry,* 10th Edition, 2014, Oxford University Press
2. Huheey, J.E. Keiter, E.A. Keiter, R.L Medhi, O.K., *Inorganic Chemistry Principles of Structure and Reactivity*, 4th Edition, Pearson Education

Paper IV/Subject Name: Engineering Graphics & Design		Subject Code: CEE022C117
L-T-P-C – 1-0-4-3	Credit Units: 03	Scheme of Evaluation: TP

Objective:

The objectives of the course are to make students understand the process of drawing projections and sections and basic engineering drawing formats and to convert sketches to engineered drawings.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the dimension and figures using the drawing instruments and acquire visualisation skills, projection of points, etc.	**BT 2**
CO 2	**Utilize** engineering curves in tracing the paths of simple machine components.	**BT 3**
CO 3	**Analyse** and assess sketches to convert them to engineered drawings.	**BT 4**

Detailed Syllabus:

Modules	Topic	Periods
I.	Handling and uses of the drawing instruments. Single stroke letters, General rules of dimensioning.	**6**
II.	Reducing and increasing scales, representative fraction, types of scales-plain, diagonal, Comparative, Vernier and Scale of chords. General method of construction of conics (Ellipse, Parabola and Hyperbola), tangent and normal on conics. Construction of ellipse by Arcs of Circle Method (tangent and normal on it) and Concentric Circle method. Cycloidal curves-Cycloid including tangent and normal on it, Trochoid, Epicycloid and Hypocycloid and tangent and normal on these curves, Archimedean Spiral and tangent and normal on it.	**12**
III.	Introduction, Planes of Projection, Four Quadrants, First-Angle projection, Third-Angle projection (Introduction only). I. **Projection of points:** In different quadrants. II. **Projections of lines:** Inclined one plane and parallel to other. Inclined to both planes, true length of a line and its inclination to reference plane, traces of a line. III. **Projection of a plane:** Traces of a plane, projection of planes parallel to one of the reference planes, projection of planes inclined to one reference plane and perpendicular to the other, Projection of oblique planes: square, rectangle, hexagon and set square.	**12**

	IV. **Projection of solids:** Simple solids in different positions, axis perpendicular to a plane axis parallel to both planes, axis parallel to one plane and inclined to the other, axis inclined to both planes, axis or edges makes given angles the face of a solid makes given angles.	
IV.	Isometric axes and scales, isometric projection of plane figures, cube, prism, pyramids, cylinder, cone, sphere.	**6**
	TOTAL	**36**

Text Books:

1. *Engineering Drawing;* Bhatt, N.D, 53rd Edition, 2016, Charotar Publishing House

Reference Books:

1. Jolhe Dhananjay A; *Engineering drawing*, 5th Edition, 2010,Tata McGraw-Hill Education Pvt. Ltd., New Delhi

Paper V/Subject Name: Workshop Practices		Subject Code: MEE022C118
L-T-P-C – 1-0-4-3	Credit Units: 03	Scheme of Evaluation: TP

Objective:

The objectives of the course are to make the students learn about basic machining skills and develop skill in in dignity of labour, precision, safety at workplace, etc.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the different manufacturing processes which are commonly employed in the industry	**BT 2**
CO 2	**Utilize** tools, instruments and techniques learnt to perform basic household chores in terms of house wiring, carpentry etc	**BT 3**
CO 3	**Experiment**using the tools and techniques learnt for various purposes and decide on the best prospect.	**BT 4**

(i) Lectures & videos (L-T-P-C: 1-0-0-0): (12 hours)

S. No.	Detailed Contents	Lectures
1	Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods	2
2	Welding (arc welding & gas welding), brazing	2
3	Fitting operations & power tools	2
4	Carpentry	2
5	Electrical & Electronics – electrical & electronic component	2
6	Computer Hardware	2
7	Civil – Plumbing	

(ii) **Workshop Practice (L-T-P-C: 0-0-4-0)**: (48 hours)

S. No.	Detailed Contents	Hours
1	Machine shop	8
2	Fitting shop	8
3	Carpentry	8
4	Welding shop	8
5	Electrical & Electronics	8
6	Computer Hardware	4
7	Plumbing Shop	4

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Paper VI/Subject Name: Developing Oral Communication and Listening Skills	Subject Code: CEN982A101	
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: TP

Objective:

The objectives of the course are to develop and enhance the students' oral communication skills in English by engaging them to meaningful discussion and interactive activities.

Prerequisites: Basic knowledge of English language

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basics of written and oral communication.	**BT 2**
CO 2	**Apply** the concepts learnt in day-to-day life.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Basics of Communication-Introduction**	Communication-Definition, Meaning, Elements. Basics of Communication- Communication Process, Importance of Communication, Components of Communication, Types/ Forms of Communication (Oral-Written, Formal-Informal (Grapevine), Interpersonal-Intrapersonal, Mass-Group, Verbal-Non Verbal External Communication, Organisational, Upward, Downward, Horizontal, Diagonal). Non-Verbal Communication-Introduction, Body Language, Personal Appearance, Postures, Gestures, Eye-contact, Facial Expressions, Paralinguistic Features-Rate, Pause, Volume, Pitch/ Intonation/Voice/modulation, Proxemics, Haptics, Artifacts, Chronemics	**3**
II	**Listening Process**	Types of Listening-Superficial, Appreciative, Focused, Evaluative, Attentive, Emphatic, Listening with a Purpose, Barriers to Communication, Barriers to Listening	**3**
III	**Focussing on Oral Group Communication**	Nature of Group Communication, Characteristics of successful Group Communication Selection of Group Discussion,-Subject, Knowledge, Leadership Skills, Team Management, Group Discussion Strategies	**3**
IV	**Language Styles- Oral and Written Communication**	Technical Style, ABC of Technical Communication- Accuracy, using Exact Words and Phrases, Brevity, Clarity. Objectivity of Technical Writing, Impersonal Language, Objectivity in Professional Speaking, Formal Language, Practice	**3**
		Total	**12**

Text Books:

1. *Effective Technical Communication,* Rizvi, M.A., 11 reprint, 2008, Tata McGraw Hill. New Delhi

Reference Books:

1. Koneru, Aruna. *Professional Communication,* 1st Edition 2014, Tata McGraw Hill, India
2. Hair, Dan O., Rubenstein, Hannah and Stewart, Rob*, Pocket guide to public speaking,* 5th Edition, 20015, Bedford/St. Martin's.

Paper VII/Subject Name: Environmental Sciences-I		Subject Code: EVS982A103
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: T

Objective:

The objectives of the course are to create awareness about the importance of environment and to teach about the effect of technology on the environment and ecological balance

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand**the importance of environmental studies and methods of conservation of natural resources.	**BT 2**
CO 2	**Apply** the knowledge in protecting and conserving the environment	**BT 3**
CO 3	**Analyze** the causes, effects and control measures of various types of pollution	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Environmental Science Basics**	Environment, Levels of organizations in environment, Structure and functions in an ecosystem.	**3**
II	**Biosphere**	Biosphere, its Origin and distribution on land, in water and in air, Broad nature of chemical composition of plants and animals	**3**
III	**Natural Resources**	Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative)	**3**
IV	**Biodiversity and its Conservation**	Biodiversity at global, national and local levels; India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation	**3**
Total			**12**

Text Book:

1. *Perspectives in Environmental Studies,* Kaushik, A., Kaushik, C.P., 4th Edition, 2014, New Age International (P) Ltd. Publishers, New Delhi – 110 002.

Reference Books:

1. Sinha, J., *Environmental Science,* 1st Edition, 2011, Galgotia Publication Pvt Ltd, Darya Ganj, Delhi 110002.
2. Agarwal, R.K., *Environment & Ecology,* 1st Edition, 2008, Krishna Prakashan Media (P) Ltd, Meerut, India.

Paper VIII/Subject Name: Concepts of Behavioural Science		Subject Code: BHS982S104
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students understand the various elements of behavioral science, the way it is conducted and applied in different researches.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the various elements of behavioural science.	**BT 2**
CO 2	**Apply**the concepts learnt in their real life.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Western Philosophy to present Behavioral Science**	Brief history Sources of knowledge The problem of reliable knowledge Dynamics of development in the Behavioural and Social Sciences	**3**
II	**Behavioral and Social Science Disciplines**	Understanding various behavioural and social science disciplines like Psychology, Sociology, Anthropology, Economics, Political Science, Geography, History and Statistics	**3**
III	**Modes and Methods**	Experimentation Statistical control Statistically uncontrolled observation	**3**
IV	**Applications**	Three fundamental features of basic research in Behavioural Sciences Exploring examples of behavioural science research	**3**
Total			**12**

Text Books:

1. Adams, R. M., Smelser, N. J. &Treiman, D. J., *Behavioral and social science research: A national resource(Part I),* Washington: National Academy Press.

Reference Books:

1. O'Grady, M. *An introduction to behavioural science,* 2001, Gill & Macmillan, London.

14. DETAILED SYLLABUS OF 2ND SEMESTER

Paper II/Subject Name: Physics		Subject Code:PHY022C201
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students understand the basics of fundamental phenomenon of Physics and its applications in engineering & technology.

Prerequisites: Concepts of Physics of +2 level

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basic concepts of Physics	**BT 2**
CO 2	**Identify** the applications of Physics in technical field.	**BT 3**

Detailed Syllabus:

Modules	Topics / Course content	Hours
I.	Stress and Strain, Hooke's law, Types of elasticity, Equivalence of a shear to a compression and an extension at right angles to each other, Relation connecting the elastic constants. Dielectrics And Magnetic Material: Dielectric Constant and Dielectric Susceptibility of a material, Polarizability and Polarization, Different types of Polarization, Magnetisation, Classification: Ferro, Dia and Paramagnetism. Magnetisation curves B-H Curves, Hysteresis, Soft and Hard Magnetic Material.	**9**
II.	Weber Fechner law, Units of Loudness- Decibel, Phon, Sone, Absorption coefficient, Reverberation, Reverberation time, Sabine's formula for reverberation time (Derivation not required), Factors affecting acoustics of buildings and their remedies, Design of a Good Acoustical Building Interference of light, Types of Interference (division of wave front and division of amplitude) Polarization, Double refraction, Nichol's Prism. Fresnel and Fraunhoffer diffraction.	**9**
III.	Production of X-rays - Coolidge tube, Origin of X-rays, Types of X-rays –Continuous and characteristic X-rays, Moseley's law. Bragg's law. De-Broglie hypothesis (concept of group velocity and phase velocity), Expression for de-Broglie wavelength in terms of group velocity and phase velocity, Davisson and Germer Experiment, Heisenberg's Uncertainty principle and its applications.	**9**

IV.	Laser Induced absorption, Spontaneous and Stimulated emission, Einstein's coefficients (A & B), Population Inversion, Pumping, Principle of Laser, and Characteristics of a laser beam. Introduction to semiconductor, Semiconductor Laser, Applications of Laser. Optical fibre- Principles and Structure, Propagation of light in optical fibre, Numerical aperture and acceptance angle, Classification of optical fibre - Single and Multimode, Step Index and Graded Index fibre, Loss in fibre, Optical fibre communication system (Block diagram only).	**9**
Total		**36**

Text Books:

1. *Elements of properties of matter,*Mathur D.S., 7th Edition, Revised Edition, 2005, S.Chand publication, New Delhi.
2. *Electricity and Magnetism,* Tayal D.C, Publisher, 4th Edition, 2017, Himalaya Publishing House,New Delhi.
3. *Geometrical and Physical Optics,* Chakraborty P.K., 3rd Edition, 2005, New Central Book agency (P) Ltd.
4. *Concept of Modern physics,* Arthur Beiser, Shobhit Mahajan, S. Rai.Choudhury, 6th Edition, 2009, McGraw-Hill education Private limited. New Delhi.
5. *A Textbook of Oscillations, Waves and Acoustics,*M Ghosh & D Bhattacharya, 5th Edition, 2016, S.Chand publication.

Reference Books:

1. Singh A.K. and Malik Hitendra *Engineering Physics,* 2nd Edition, 2016, McGraw Hill Education Private Limited. New Delhi.
2. GaurR.K and Gupta S.L,*Engineering Physics*, 2015, Dhanpat Rai publication, New Delhi.

Paper II/Subject Name: Mathematics-II		Subject Code:MAT022C202
L-T-P-C – 3-1-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students understand fundamental concepts of ODE and PDE theories and where and how such equations arise in applications to scientific and engineering problems and to explain how to apply vector algebra and calculus in engineering problems.

Prerequisites: Concepts of Mathematics I

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** Vector and its applications in applied sciences.	**BT 2**
CO 2	**Utilize** vector as a tool in the field of applied sciences and related fields.	**BT 3**
CO 3	**Analyze** and **evaluate** the qualitative behavior of solutions of systems of differential equations and interpret in the context of an underlying	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Ordinary Differential Equations:** .	Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.	**12**
II	**First order Partial differential equation:**	Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type,	**12**
III	**Second order Partial differential equation:**	Second order partial differential equation, Monge‟s method. The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.	**12**
IV	**Vector Analysis:**	Scalar and vector triple products, Scalar and vector products of four vectors, reciprocal vector triad, vector equation of straight line, plane and sphere. Vector function of a scalar variable, differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, Directional derivative, divergence and curl of a vector point function, Idea of line, surface and volume integrals, Green's theorem, Gauss' Divergence Theorem and Stokes' theorem	**12**

		(statements and applications).	
TOTAL			**48**

Text Books:

1. *A text book of Engineering Mathematics*, Bali N. P. and Narayan Iyenger N., 9th Edition, 2016, Laxmi Publication.
2. *Mathematical Methods for Physics and Engineering: A Comprehensive Guide,* K. F. Riley, M. P. Hobson, 3rd Edition, 2006, Cambridge University Press

Reference Books:

1. Grewal B. S.,*Higher Engineering Mathematics,* 43rd Edition, 2014, Khanna Publishers.
2. Raisinghania M.D., *Ordinary and Partial Differential Equations*, 17th Edition, 2014, S. Chand and Co., New Delhi.
3. NaraynaS., *A Text Book of Vector Calculus,* Revised Edition, 2009, S. Chand & Co., New Delhi.

Paper III/Subject Name: Basic Electrical Engineering		Subject Code:ELE022C203
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to make students understand the basic electrical terminologies and familiarize them with the basic concepts of d.c., single-phase and three-phase a.c. networks.

Prerequisites: Basic concepts of D.C. networks of Class XII, Electromagnetic Induction and A.C. Fundamentals etc.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand**the concept behind basic electric and magnetic circuits.	**BT 2**
CO 2	**Apply** the working principles of electrical machines and power converters in real-life.	**BT 3**

Detailed Syllabus:

Modules	Topic	Course Content	Hours
I.	**DC Circuits:**	Definitions of active, passive, linear, nonlinear circuit elements andnetworks. Electrical circuit elements (R, L and C), voltage andcurrent sources. Kirchhoff's laws, nodal & mesh analysis, voltage &current sources, network theorems- superposition, Thevenin's, Norton's and Maximum Power Transfer theorems.	**9**
II.	**AC Circuits:**	Waveforms of alternating voltages and currents, instantaneous,average and RMS values, form factor & peak factor, forms ofrepresentation of alternating quantities, concept of phasor &phasordiagrams, Concept of lead & lag, reactance & impedances.Representation of sinusoidal waveforms, peak and r.m.s values,phasor representation, real power, reactive power, apparent power,power factor. Analysis of single-phase ac circuits consisting of R, L,C, RL, RC, RLC combinations (series and parallel), resonance.	**9**
III.	**Electrical Machines:**	**Single Phase Transformers**: Principle of operation, EMF equation,losses and efficiency. **DC machines**: Electromechanical Energy Conversion, EMF andtorque equations, Classification, characteristics and applications ofvarious types of d.c. motors.	**9**

IV.	**Electrical Installations:**	Basic knowledge of domestic wiring, types of cables (names only),types of wiring; circuit layouts- single phase AC mains to DB; 3phase connections; accessories- main switch, ceiling rose, fuse,MCB etc. Earthing- purpose & methods. Batteries. **AC 3-Phase:**Concepts of 3-phase AC, connections, phase & line values in star &delta connections, solutions of simple 3-phase balanced circuits with resistive& reactive loads, 3-phase power, and phase sequence. **Instruments:**Classification of instruments, essentials of indicating type instruments- deflecting torque, controlling torque, damping; types ofindicating instruments, MC & MI type ammeters & voltmeters	**9**
		TOTAL	**36**

Text Books:

1. *A Text Book of Electrical Technology*, Thereja, B.L., 1st Edition revised, 2008, S Chand & Company Ltd. Ram Nagar; New Delhi.
2. *Basic Electrical Engineering*, D. P. Kothari, I. J.Nagrath, 3rd Edition, 2009, Tata McGraw-Hill

Reference Books:

1. D. C. Kulshreshtha, *Basic Electrical Engineering*,1st Edition, 2009, McGraw-Hill
2. E. Hughes, *Electrical and Electronics Technology,*10th Edition, 2011,Pearson Publication

Paper IV/Subject Name: Programming for Problem Solving		Subject Code:CSE022C204
L-T-P-C – 3-0-0-3	Credit Units: 043	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students capable of using C programming to solve basic as well as advanced computing problems.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** the working of C programming language.	**BT 2**
CO 2	**Apply** the programming concepts to solve various problems.	**BT 3**
CO 3	**Analyze** and debug the errors while writing the programs.	**BT 4**
CO 4	**Assess** and design a new algorithm to solve a new real life problem.	**BT 5**

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Fundamentals of Computers and Computing Concepts**	History of computers and computing, generations of computers, classification, Anatomy of a Computer System.Software and Operating Systems for Computers. Number systems. Basic idea of Computer Algorithms and Flow Charts.	**9**
II	**Basic concepts of C programming**	History and importance of C language, Basic structure of programs, programming style, execution of C programs.Character set, Tokens, Keywords and Identifiers, Constants, variables, data types, statements, comments, declaration of storage class, assigning values to variables.Managing I/O, reading and writing characters, formatted Input/output.Arithmetic operators, relational operators, logical operators, assignment operators, increment & decrement operators, conditional operators, bitwise operators, special operators.	**9**
III	**Decision Making, Iterative Statements, Arrays& Strings**	Importance of decision making, decision making with *if* statement, *if-else* statement, nested *if-else* statements, *switch-case* statement, *goto* statement, examples.Importance of iterative statements, the *while* statement, *do-while* statement, *for* statement, nested *for* loop, examples.Significance of Arrays, creation and use of one & two dimensional arrays.Declaration and use of string variables, reading and writing strings, operations on strings.	**9**

IV	**Advanced Programming Concepts using C**	Benefits of user-defined functions, creation and use of user-defined functions, parameter passing, return types.Introduction to Pointers, declaration & initialization of pointer variables, accessing a variable through its pointer. Creation of Structures in C, Defining, opening & closing files in C.	**9**
		TOTAL	**36**

Text Book:

1. *Computer Fundamentals and Programming in C,*Reema Thareja, 2nd Edition, 2016, Oxford University Press, Delhi.

Reference Books:

1. E Balaguruswamy, *Computing Fundamentals and C Programming*, 1st Edition, 2017, McGraw Hill.
2. Venugopal and Prasad, *Mastering C*, 2nd Edition, 2017, Tata McGraw Hill.
3. YashawantKanetkar,*Let us C,* 15th Edition, 2017, BPB.

Paper V/Subject Name: Physics Lab		Subject Code:PHY022C211
L-T-P-C – 0-0-2-1	Credit Units: 01	Scheme of Evaluation: P

Objective:

The objectives of the course are to make the students understand the basics of fundamental phenomenon of Physics and application in engineering & technology.

Prerequisites: Concepts f Physics of +2 level

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** various experimental principles, instruments/setup, and procedures	**BT 2**
CO 2	**Organize**experimental data in various appropriate forms like tabulation and plots.	**BT 3**
CO 3	**Analyze** and **assess** the experimental results	**BT 4 & 5**

Detailed Syllabus:

Experiment	Experiment Title	Lab Hours
I	Determination of Moment of Inertia of a given solid about its own axis by using M.I.Table	2
II	Determination of Young's Modulus using Searle's Apparatus	2
III	Determination of Rigidity of Modulus of the material of the given rod by Statiscal method	2
IV	Determination of Powers of Given lenses using an Optical Bench i. Concave Lens , ii Convex Lens	2
V	Determination of Resistance of a Galvanometer using Post Office Box.	2
VI	To determine the mechanical equivalent of heat by Joules calorimeter	2
VII	Determination of ratio of E.M.F of two cells using Potentiometer.	2
VIII	To determination of the focal length of a convex mirror with the help of an auxiliary lens.	2
IX	Determination of Horizontal Components of Earth's Magnetic field using Magnetometer	2
X	Determination of coefficient of Viscosity of water by Capillary Flow Method	2

Text Books:

1. *Elements of properties of matter,*Mathur .D.S., 7th Edition, S.Chand publication, New Delhi.

2. *Electricity and Magnetism,* Tayal D.C, Publisher, 4th Edition, 2017, Himalaya Publishing House,New Delhi.
3. *Geometrical and Physical Optics,* Chakraborty P.K., 3rdEdition, 2005, New Central Book agency (P) Ltd.
4. *Concept of Modern physics,* Arthur Beiser, Shobhit Mahajan, S. Rai.Choudhury, 6th Edition, 2009, McGraw-Hill education Private limited. New Delhi.
5. *A Textbook of Oscillations, Waves and Acoustics,*M Ghosh & D Bhattacharya, 5th Edition, 2016, S.Chand publication.

Reference Books:

1. Singh A.K. and Malik Hitendra *Engineering Physics,* 2ndEdition, 2016, McGraw Hill education private limited. New Delhi.
2. GaurR.K and Gupta S.L,*Engineering Physics*, 2015, Dhanpat Rai publication, New Delhi.

L-T-P-C – 0-0-2-1 **Credit Units: 01** **Scheme of Evaluation: P**

Objective:

The objectives of the course are to make the students understand basic concepts of electrical engineering and to expose the students to the operation of DC generator, motor and transformer.

Prerequisites: Concepts of Physics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the concept of circuit laws and network theorems and apply them to laboratory measurements.	**BT 2**
CO 2	**Apply** the equations that characterize the performance of an electric circuit as well as solving both single phase and DC Machines.	**BT 3**
CO 3	**Analyze**skills in using electrical measuring devices.	**BT 4**

Detailed Syllabus:

Lab	**Experiments**	**Hours**
I	To verify Thevenin's Theorem for DC network	**2**
II	To verify Maximum Power Transfer Theorem for DC network	**2**
III	Study of R-L-C Series circuit and determine R,L,C, cosΦ,P and Q and draw the phasor diagram	**2**
IV	Study of R-L-C Parallel circuit and determine R,L,C, cosΦ,P and Q and draw the phasor diagram	**2**
V	Calibration of a milli-ammeter as a voltmeter.	**2**
VI	To determine the ohmic and effective resistance (armature winding)	**2**
VII	To study the characteristics of a filament lamp	**2**
VIII	To measure the power in a single phase load using one wattmeter	**2**
IX	To measure the insulation resistance using Megger	**2**
X	Demonstration of house wiring	**2**
	TOTAL	**20**

Text Books:

1. *Basic Electrical Engineering*, Chakrabarti, Nath, Chanda, 1st Edition, 2008, Tata McGraw-Hill Education Pvt. Ltd. India; New Delhi.
2. *A Text Book of Electrical Technology*, Thereja, B.L.,1st Edition revised, 2008, S Chand & Company Ltd. Ram Nagar, New Delhi.

Reference Books:

1. Cotton H, *Advanced Electrical Technology*, 7th Edition, 2011, Reem Publications Pvt. Ltd., New Delhi.
2. Smith, Parker,*Problems in Electrical Engineering,*9th Edition, 2003, CBS Publisher & Distributor; Delhi.
3. Toro, V.D,*Electrical Engineering Fundamentals*, 2ndEdition, 2015, Prentice Hall India Learning Private Limited, Delhi.
4. Cogdell, J.R,*Foundations of Electrical Engineering,* 2nd Edition, 1995,Pearson Higher Ed, USA.

L-T-P-C – 0-0-2-1 **Credit Units: 01** **Scheme of Evaluation: P**

Objective:

The objectives of the course are to make the student learn about problem solving techniques through C programming language and to enhance the analyzing and problem solving skills.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** and trace the execution of programs written in C language.	**BT 2**
CO 2	**Build** the C code for a given algorithm using various concepts such as pointers and arrays, perform pointer-arithmetic, and use the pre-	**BT 3**
CO 3	**Analyze,** debug and solve errors and design efficient solutions to various solutions.	**BT 4**

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Character set, Tokens, Keywords and Identifiers, Constants, variables, data types, statements, comments, declaration of storage class, assigning values to variables.
2. Managing I/O, reading and writing characters, formatted Input/output.
3. Arithmetic operators, relational operators, logical operators, assignment operators, increment & decrement operators, conditional operators, bitwise operators, special operators.
4. Importance of decision making, decision making with if statement, if-else statement, nested if-else statements, switch-casestatement..
5. Importance of iterative statements, the while statement, do-while statement, for statement, nested for looping.
6. Significance of Arrays, creation and use of one & two dimensional arrays
7. Declaration and use of string variables, reading and writing strings.
8. Benefits of user-defined functions, creation and use of user-defined functions, parameter passing, return types.
9. Use of Pointers, declaration & initialization of pointer variables, accessing a variable through its pointer.
10. Defining, opening & closing files in C.

Text Book:

1. *Computer Fundamentals and Programming in C,*Reema Thareja, 2nd Edition, 2016, Oxford University Press, Delhi.

Reference Books:

1. E Balaguruswamy, *Computing Fundamentals and C Programming*, 1st Edition, 2017, McGraw Hill.
2. Venugopal and Prasad, *Mastering C*, 2nd Edition, 2017, Tata McGraw Hill.
3. YashawantKanetkar,*Let us C,* 15th Edition, 2017, BPB.

Paper VIII/Subject Name: Conversation and Public Speaking		Subject Code:CEN982A201
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: TP

Objective:

The objectives of the course are to give students a platform to enhance their speaking and conversational skills in English by engaging them in meaningful discussions and interactive activities.

Prerequisites: Basic understanding of conversation and speaking in public.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** various skills of speaking at different levels.	**BT 2**
CO 2	**Apply** the skills learnt in their day-to-day life.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Speaking Skills**	Speaking-The Art of Speaking, Goals, Speaking Styles, Speaking Process, Importance of Oral Communication, Choosing the form of Communication, Principles and Guidelines of Successful Oral Communication, Barriers to Effective Oral Communication, Three aspects of Oral Communication-Conversing, Listening and Body Language, Intercultural Oral Communication	**3**
II	**Conversational Skills: Listening and Persuasive Speaking**	Introduction, Conversation- Types of Communication, Strategies for Effectiveness, Conversation Practice, Persuasive Functions in Conversation, Telephonic Conversation and Etiquette, Dialogue Writing, Conversation Control	**3**
III	**Transactional Analysis**	The Role of Intonation, Strokes, Psychological Characteristics of Ego States (The Parent, The Adult, The Child), Structure and Aspects of Human Personality, Analysis Transactions-Complementary Transactions, Crossed Transactions, Duplex or Ulterior Transactions, How to Identify the Ego States of the Interacting Individuals, How to Manage Conversations, Structural Analysis, Certain Habits of Ineffective Conversationalists	**3**
IV	**Business Presentation and Public Speaking**	Business Presentation and Speeches–Difference, Elements of a Good Speech-Planning, Occasion, Audience, Purpose, Thesis, Material, Organising and Outlining a Speech Outline, Types of Delivery, Guidelines for Delivery–Verbal Elements, Non-Verbal	**3**

		Elements, Vocal Elements, Visual Elements, Controlling Nervousness and Stage Fright	
			TOTAL **12**

Text Books:

1. *Business Communication,* Raman Meenakshi and Prakash Singh. Oxford University Press. Page 123–165
2. *Technical Communication,* Raman Meenakshi and Sangeeta Sharma. Oxford University Press. Page 137-148

Reference Books:

1. Sengupta Sailesh, *Business and Managerial Communication.*PHILearningPvt. Ltd. Page 136-153
2. Mehra Payal, *Business Communication for Managers,* Pearson, Page 75–83

Paper IX/Subject Name: Environmental Sciences-II		Subject Code:EVS982A203
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: T

Objective:

The objectives of the course are to create awareness among the students about the importance of environment and to make themlearn the effect of technology on the environment and ecological balance

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the importance of environmental studies and methods of conservation of natural resources.	**BT 2**
CO 2	**Apply** the knowledge in protecting and conserving the environment.	**BT 3**
CO 3	**Analyse** the causes, effects and control measures of various types of pollution	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Environmental Pollution**	Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear; Pollution prevention; Management of pollution– Rural/Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar),	**3**
II	**Social Issues and Environment**	Solid/Liquid waste management, disaster management	**3**
III	**Urban Environment Issues**	Problems relating to urban environment- Population pressure, water scarcity, industrialization, remedial measures	**3**
IV	**Climate Change**	Climate Change – reasons, effects, (global warming, ozone layer depletion, acid rain) with one case study; Legal issues – Environmental legislation (Acts & issues involved), Environmental Ethics; Environmental monitoring, covering, Monitoring – Identification of Environment	**3**
		TOTAL	**12**

Text Book:

1. *Perspectives in Environmental Studies,* Kaushik, A., Kaushik, C.P., 4thEdition, 2014, New Age International (P) Ltd. Publishers, New Delhi – 110 002.

Reference Books:

1. Sinha, J., *Environmental Science,* 1stEdition, 2011, Galgotia Publication Pvt Ltd, Darya Ganj, Delhi 110002.
2. Agarwal, R.K., *Environment & Ecology,* 1stEdition, 2008, Krishna Prakashan Media (P) Ltd, Meerut, India.
3. Miller, T.G., Spoolman, S., *Environmental Science,* 15thEdition, 2014, Cengage Learning, 20 Channel Street, Boston, MA 02210, USA

Paper X/Subject Name: Understanding Self and Others		Subject Code:BHS982A204
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: T

Objective:

The objectives of the course are to provide students insight into the various aspects of self and how one perceives and comprehends other's behaviour in the light of their present appearance

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** and visualize one's own self	**BT 2**
CO 2	**Interpret** one's own behavior	**BT 3**
CO 3	**Analyse**other's behavior in the light of their present appearance.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Self and Identity**	Separated and Connected perspective Immersed and Distal perspective Self-concept, self-esteem and self-efficacy Personal and social identity	**3**
II	**Structure and Functions of Identity**	Continuity and differentiation Identity crisis: Erikson and Marcia Quarterlife crisis- a new concept of understanding young people's difficulties in transitioning to adulthood	**3**
III	**Social Perception**	Making sense and categorizing information from environment Person schemas and group stereotypes	**3**
IV	**Attribution**	Attribution theory Dispositional versus situational attributions Inferring dispositions from acts Co-variation model of attribution Attributions for success and failure Bias and error in attribution Over-attribution to dispositions Focus of attention bias Actor observer difference Motivational biases Cultural basis of attributions	**3**
		TOTAL	**12**

Text Books:

1. Baron, R. A.&Branscombe, N. R.,*Social Psychology*, 13th Edition, 2012, US Pearson.
2. Baumeister, R. F., *Self-concept, self-esteem and identity*., In Varerian, J. D., Barbara, W. A. & Warren, J. H. (Eds*), Personality: Contemporary Theory and Ethnicity,* (pp. 339-375). US: Nelson-Hall Publishers

Reference Books:

1. Leary, M.R. & Tangney, J. P., Handbook of Self and Identity, 2012, New York: The Guilford Press.

15. DETAILED SYLLABUS OF 3RD SEMESTER

Paper I/Subject Name: Mathematics-III		Subject Code:MAT022C301
L-T-P-C – 3-1-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are to provide the fundamentals & concept of probability theory, Random Variables, Estimation theory, Correlation, Regression and Testing of hypothesis, and numerical methods to solve algebraic and transcendental and differential equations.

Prerequisites: Concepts of Mathematics I and II

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the importance of random variables and probability distributions and their applications.	**BT 2**
CO 2	**Solve** a differential, algebraic or transcendental equation using an appropriate numerical method.	**BT 3**
CO 3	**Analyse** a derivative at a value using an appropriate numerical method	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Probability**	Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality. Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.	**12**
II	**Statistics**	Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis -Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances - Chi-square test for goodness of fit and independence of attributes	**12**

III	**Numerical Methods-I**	Finite differences, Relation between operators,Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	**12**
IV	**Numerical Methods-II**	Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Numerical solution of ordinary differential equations: Taylor's series, Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Predictor-corrector methods.	**12**
		TOTAL	**48**

Text Books:

1. *Introduction to Probability Theory*, Hoel P. G., Port S. C. and Stone C. J., 1st Edition, Universal Book Stall.
2. *Introductory Methods of Numerical Analysis,* Satry S. S, 4th Edition, 2005, PHI.

Reference Books:

1. Grewal B. S., *Higher Engineering Mathematics*, 43rd Eition, 2014, Khanna Publishers.
2. Bali N. P. and Narayan Iyenger N,*A text book of Engineering Mathematics*, 9th Edition, 2016, Laxmi Publication.
3. KreyszigE., *Advanced Engineering Mathematics,* 9th Edition, 2011, Wiley Eastern Ltd.

Paper II/Subject Name: Discrete Mathematics		Subject Code:MAT022C302
L-T-P-C – 3-1-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students learn the concept of mathematical logic, sets, relations, and functions, generating functions and recurrence relations, Graph Theory for solving engineering related problems.

Prerequisites: Concepts of Mathematics I, II, III

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the concept of logic, sets, relations and functions to solve problems.	**BT 2**
CO 2	**Apply** the concepts learnt to solve computer science related problems.	**BT 3**
CO 3	**Analyze** and evaluate the solutions.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Sets, Relations and Functions**	Operations and Laws of Sets, Binary, Relation, Partial Ordering Relation, Equivalence Relation, Functions, Inverse and Composite Function, Finite and infinite Sets, Countable and uncountable Sets, Poset, Lattice. The Well-Ordering Principle, The Division algorithm: Prime numbers, The Greatest Common Divisor, The least common multiple, Euclidean Algorithm, The Fundamental Theorem of Arithmetic, Congruence, Euler's phi function.	**12**
II	**Graph Theory and Combinatorics**	Graphs and their properties, Degree, subgraphs, walks, paths and circuits, connected and disconnected graphs, Isomorphism, Eulerian and Hamiltonian graphs, Complete graphs, Bipartite graph, Trees, Properties of trees, Pendant vertex, Distance and Centers, Binary tree, Spanning trees, Planar graphs, Matrix representation of graphs, Chromatic number, Chromatic polynomial, Five colours theorem. Pigeon-hole principle, permutation and combination,Recurrence relations, Generating functions.	**12**
III	**Propositional Logic**	Proposition, connectives, tautology, contradiction, logical equivalence, normal forms-DNF, CNF, argument, Validity of argument, fallacy, Rules of Inference, Quantifiers. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function.	**12**
IV	**Algebraic Structures**	Algebraic Structures with one Binary Operation,Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures,	**12**

		Free and Cyclic Monoids and Groups, Permutation Groups, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields.	
			TOTAL **48**

Text Books:

1. *A text book of Discrete Mathematics*, Sarkar S. K., Revised Edition, 2016, S Chand & Co Ltd.

Reference Books:

1. Deo N; *Graph Theory with applications to engineering and computer science*, New Edition, 2009, PHI Learning Private Limited.
2. Chandrasekaran N. and Umaparvathi, *Discrete Mathematics*, Eastern Economic Edition, 2013, PHI
3. *Discrete Mathematics and its Applications,*Rosen, K.H.,6th Edition, 2006, McGraw Hill.
4. Tremblay, J.P. and Manohar, R., *Discrete Mathematical Structures with Applications to Computer Science*, 35th Reprint, 2007, Tata McGraw Hill

L-T-P-C – 3-0-0-3 **Credit Units: 03** **Scheme of Evaluation: T**

Objective:

The objectives of the course are to make the students understand about the data structures, how to implement them in C, their advantages and drawbacks, & how they can be overcome.

Prerequisites: Concepts of Computer Programming

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Relate** and**understand** the basic constructs of data structure,implementation and application.	**BT 1 &2**
CO 2	**Utilize** the appropriate data structure in context of solution of given problem.	**BT 3**
CO 3	**Analyze** and **evaluate** the pseudocodes for their complexity analysis.	**BT 4 & 5**

Detailed Syllabus:

Modules	**Topics**	**Course content**	**Hours**
I	**Linear Data Structure- I**	a. Introduction: Why we need data structure? Concepts of data structures: Data and data structure, Abstract Data Type and Data Type. Algorithms and programs, basic idea of pseudo-code. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations. b. Array : Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. c. Linked List: Singly linked list, circular linked list, doubly linked list, linked list representation of polynomial and applications.	**9**
II	**Linear Data Structure- II**	**a. Stack and Queue:** Stack and its implementations (using array, using linked list applications. Queue, circular queue, dequeuers. Implementation of queue- both linear and circular (using array, using linked list), applications. **b. Recursion:** Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.	**9**
III	**Nonlinear Data Structures**	**a. Trees:** Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post-order), threaded binary tree (left, right, full) - non-recursive traversal algorithms using threaded binary tree, expression tree. Binary search tree- operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree (insertion, deletion with examples only).	**9**

		b. Graphs: Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path, isomorphism). Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge), applications. Minimal spanning tree – Prim's algorithm (basic idea of greedy methods). B-Trees operation	
IV	**Searching, Sorting**	**a. Sorting Algorithms:** Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort. **b**. **Searching Algorithms:** Sequential search, binary search, interpolation search.	**9**
TOTAL			**36**

Text Books:

1. *Data Structures Using C*, Reema Thareja, 2nd Edition, 2014, Oxford University Press.

Reference Books:

1. Seymour Lipschutz, *Data Structures*, 1st Edition (reprint) 2017, McGraw Hill Education.
2. Narasimha Karumanchi, *Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles*, 5th Edition, 2016, Careermonk Publications.
3. Horowitz, Sahni and Anderson-Freed, *Fundamentals of Data Structures in C*, 2nd Edition, 2008, Universities Press.
4. E. Balagurusamy, *Data Structures Using C*, 1st Edition, 2017, McGraw Hill Education.

L-T-P-C – 3-1-0-4 **Credit Units: 04** **Scheme of Evaluation: T**

Objective:

The objectives of the course are to explain about the machine instructions and basic computer organization andI/O subsystems and pipelining processing

Prerequisites: Fundamental concepts of Digital Logic

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** computer architecture concepts related to design of modern processors, memories and I/O	**BT 2**
CO 2	**Construct** and **analyse** the performance of commercially available computers.	**BT 3& 4**

Detailed Syllabus:

Modules	**Topics**	**Course Content**	**Hours**
I	**Basic organization of computers and machine instructions**	Block level description of the functional units as related to the execution of a program; Fetch, decode and execute cycle. Instruction set architectures, Assembly language programming, addressing modes, instruction cycles, registers and storage, addressing modes; discussions about RISC versus CISC architectures; Inside a CPU.	**12**
II	**Information representation**	Floating point representation (IEEE 754), computer arithmetic and their implementation; Fixed-Point Arithmetic: Addition, Subtraction, Multiplication and Division, Arithmetic Logic Units control and data path, data path components, design of ALU and data path, controller design; Hardwired and Microprogrammed Control	**12**
III	**Memory Technology**	Static and dynamic memory, Random Access and Serial Access Memories, Cache memory and Memory Hierarchy, Address Mapping, Cache updation schemes, Virtual memory and memory management unit.	**12**
IV	**I/O subsystems & Pipeline Processing**	Input-Output devices such as Disk, CD-ROM, Printer etc.; Interfacing with IO devices, keyboard and display interfaces; Basic concepts Bus Control, Read Write operations, Programmed IO, Concept of handshaking, Polled and Interrupt-driven I/O, DMA data transfer. Instruction and Arithmetic Pipeline, Pipeline hazards and their resolution, Parallel Processing.	**12**
		TOTAL	**48**

Text Books:

1. *Computer System and Architecture*, Moris Mano, 3rd Edition, 2007, PHI.
2. *Structured Computer Organization,* A. S. Tanenbaum, 5th Edition, 2009, Prentice Hall of India

Reference Books:

1. V. C. Hamacher, Z. G. Vranesic and S. G. Zaky, *Computer Organization,* 5th Edition, 20011, McGraw Hill.
2. J. L. Hennessy and D. A. Patterson,*Computer Architecture: A Quantitative Approach,* 5th Edition, 2011, Morgan Kaufmann.

L-T-P-C – 3-0-0-3 **Credit Units: 03** **Scheme of Evaluation: T**

Objective:

The objectives of the course are to make the students understand the simplification of Boolean expression and how to implement with various gates.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Define** and **understand** the concepts of combinational and sequential circuit design	**BT 1 & 2**
CO 2	**Apply** the concepts learnt to design digital circuits.	**BT 3**
CO 3	**Analyse**the outputs produced and behaviour of the different circuits.	**BT 4**

Detailed Syllabus:

Modules	**Topics**	**Course Content**	**Hours**
I	**Fundamental of Digital Electronics &Boolean algebra and its simplification**	Review of number system; Position number system – decimal, binary, octal and hexadecimal, number base conversion.Representation of negative binary numbers. Codes – BCD Gray, Excess -3 Digital signal, logic gates: AND, OR, NOT, NOR, EX-OR, EX-NOR Axioms and basic theorem of Boolean algebra. Truth table, logic function and their realization, standard representation (canonical forms) of logic gates-SOP and POS forms, MIN terms and MAX terms Simplification of logic function: K-map of 2, 3, 4 and 5 variables. Simplification of algebra and by map method. Don't care condition. Quine Mcluskey methods of simplification. Synthesis using AND, OR and INVERT and then to convert to NAND or NOR implementation	**9**
II	**Combinational logic circuit design**	Combinational logic circuit and buildings blocks. Binary adders and sub tractors. Carry look ahead adder. Encoders, Decoders,Multiplexers,Demultiplexers, Comparators, parity generators, etc. Realization of logic gates functions through decoders and multiplexers.	**9**
III	**Sequential circuits**	Flip flops: truth table and state table SR, JK, TD, race around condition, master slave conversion of flip-flops. Sequential shift register, sequence generator. Counter s: asynchronous and d Synchronous generators. Ring counter s and Johnson counter, up. Down counter modulo – N counter. Design of Synchronous sequential circuit.	**9**

IV	**Digital logic families and programmable logic devices**	Switching mode operation of PN junction, Bipolar and MOD device Bipolar families: RTL,DTL,DCTL, HTL,TTL,ECL,MOS, and CMOS logic families, Tristate logic. Gate properties fan in, fan out, propagation delay and power delay product. RAM and ROM their uses, SSI, MSI LSI and V LSI devices. Introduction to PLA, PAL TO FPGA and CPLDS,somecommonly used digital ICs	**9**
TOTAL			**36**

Text Books:

1. *Digital Logic & Computer Design*, M. Morris Mano, 1st Edition, 2016, Prentice Hall of India.
2. *Digital Principles and Applications*,P. Malvino and D. K. Leach, 8th Edition, 2014, Tata McGraw Hill.

Reference Books:

1. S. Salivahanan and S. Pravin Kumar, *Digital Logic Circuits*,1st Edition, 2010, Vikas Publishing House.
2. Stephen Brown and ZvonkoVranesic, *Fundamentals of Digital Logic with VHDL Design*,3rd Edition, 2017, McGraw Hill.
3. Sanjay Sharma, *Digital Electronics: Digital Logic Design*,1st Edition, 2013, S K Kataria& Sons.
4. Pratima Manhas and Shaveta Thakral, *Digital Logic & Design*, 1st Edition, 2013, S K Kataria& Sons.
5. A Potton, *An Introduction to Digital Logic*,Imort Edition, 2013, Palgrave.

Paper VI/Subject Name: Data Structures & Algorithms Lab		Subject Code:CSE022C313
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are to develop skills to design and analyze simple linear and nonlinear data structures and to gain knowledge in practical applications of data structures

Prerequisites: Fundamentals of Computer Programming

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand**the application of elementary data structures such as stacks, queues, linked lists, trees and graphs.	**BT 1 & 2**
CO 2	**Utilize** appropriate data structures to solve various problems.	**BT 3**
CO 3	**Analyze**and **evaluate** algorithms for its efficiency.	**BT 4 & 5**

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Classification of Data Structures, Operations on Data Structures, Abstract Data Type.
2. Stacks- Array Representation of Stacks, Operations on Stacks, Multiple Stacks, Applications of Stacks.
3. Queues- Array Representation of Queues, Linked Representation of Queues, Types of Queues, Operations on various types of Queues, Applications of Queues.
4. Linked Lists- Singly Linked Lists, Circular Linked Lists, Doubly Linked Lists, Circular Doubly Linked Lists, Header Linked Lists, Multi-Linked Lists, Operations, Applications of Linked Lists.
5. Linked List Representation of Stacks and Queues.
6. Trees- Creating a Binary Tree from a General Tree, Traversing a Binary Tree, Huffman's Tree, applications of Trees.
7. Efficient Binary Trees- Binary Search Trees, Operations on Binary Search Trees, Threaded Binary Trees, AVL Trees.
8. Searching- Linear Search, Binary Search, Interpolation Search, Jump Search.
9. Sorting- Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Radix Sort, Heap Sort, Shell Sort, Tree Sort, Comparison of Sorting Algorithms.

Text Books:

1. *Data Structures Using C*, Reema Thareja, 2nd Edition, 2014, Oxford University Press.

Reference Books:

1. Seymour Lipschutz, *Data Structures*, 1st Edition (reprint) 2017, McGraw Hill Education.
2. Narasimha Karumanchi, *Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles*, 5th Edition, 2016, Careermonk Publications.

3. Yashavant P. Kanetkar, *Data Structure through C*, 2nd Edition, 2003, BPB Publications.
4. Horowitz, Sahni and Anderson-Freed, *Fundamentals of Data Structures in C*, 2nd Edition, 2008, Universities Press.
5. E. Balagurusamy, *Data Structures Using C*, 1st Edition, 2017, McGraw Hill Education.

Paper VII/Subject Name: Digital Logic and System Design Lab		Subject Code:ECE022C312
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are to teach the students about simplification of Boolean expression and how to implement with various gates.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate**the implementation of logic gates on the bread board.	**BT 2**
CO 2	**Build** combinatorial and sequential circuits based on the concepts gained	**BT 3**

Detailed Syllabus:

- To realize a transistorized AND Gate
- To realize a transistorized OR Gate
- To realize a transistorized NOT Gate
- To realize a transistorized NAND Gate
- To realize a transistorized NOR Gate
- To verify the truth tables of logic gates using ICs
- Realization of half and full adder
- Realization of half and full subtractor
- Realization of 2:1 and 1:2 DEMUX
- Realization of Encoder and Decoder

Text Books:

1. *Digital Logic & Computer Design*, M. Morris Mano, 1st Edition, 2016, Prentice Hall of India.
2. *Digital Principles and Applications*,P.Malvino and D. K. Leach, 8th Edition, 2014, Tata McGraw Hill.

Reference Books:

1. S. Salivahanan and S. Pravin Kumar, *Digital Logic Circuits*,1st Edition, 2010, Vikas Publishing House.
2. Stephen Brown and ZvonkoVranesic, *Fundamentals of Digital Logic with VHDL Design*,3rd Edition, 2017, McGraw Hill.
3. Sanjay Sharma, *Digital Electronics: Digital Logic Design*,1st Edition, 2013, S K Kataria& Sons.
4. Pratima Manhas and Shaveta Thakral, *Digital Logic & Design*, 1st Edition, 2013, S K Kataria& Sons.
5. A Potton, *An Introduction to Digital Logic*,Imort Edition, 2013, Palgrave.

Paper VIII/Subject Name: Career Oriented Communication		Subject Code:CEN982A301
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: TP

Objective:

The objectives of the course are to prepare students to adopt different communication strategies and meet the competitive market of employment by considering relevant information related to job requirements.

Prerequisites: Basic understanding of the need to groom oneself for employment and the need for preparation of the same.

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the requirement of the job market.	**BT 2**
CO 2	**Build** oneself for the competitive market of employment with the concepts learnt.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Perfecting the Art of Speaking**	**Informative Speaking** Types of informative speaking, Informative versus persuasive topics, techniques of informative speaking, Sample informative speech and its Analysis **Persuasive Speaking** Characteristics of Persuasion, Categorizing types of persuasion, Creating the Persuasive Message, Adapting to the Audience, Building Credibility as a Speaker, Sample Persuasive Speech and its analysis	**3**
II	**Employment communication for Internship and Campus placement**	Employability versus employability, filling the industry-academia gap, Enhancing Employability : A five step approach (SWOT, JOHARI, Gathering job related information through research, Planning for employment, writing job suitability statement, reaching out to the prospective employer, preparing for the recruitment and selection process)	**3**
III	**Learning the Written Process**	Principles of effective writing Different forms of written communication used in organisations – • Business Letters- parts of business letters, Order, acceptance & cancellation, complaint & adjustment letters. • Project report – format and elements Internal office communication - office order, circular, notice, agenda, minutes.	**3**
IV	**Communication**	Preparing Resumes, Job Cover letter, Objectives of Interviews,	**3**

	for Employment	Types of Interviews, Preparing for the Job interview, Different types of questions asked in Job interview, Qualifying the English Language Test (Synonyms And Antonyms, Confusing Words, Idioms and Phrases, Sentence Completion, Spellings, Grammar, Reading Comprehension, Verbal logic)	
Total			**12**

Text Book:

1. *Business Communication: Essential Strategies for twenty-first century Managers,* Verma, Salini. 2nd Edition, 2015, Vikas Publishing House Pvt Ltd. pp 59-86, 119-165, 191-232, 243-259..

Reference Books:

1. Dufrene, Sinha, *BCOM: An Innovative Approach to learning and teaching Business Communication,* Lehman, 2011, Cengage Learning Pvt. Ltd.pp.399-405, 332-355

16. DETAILED SYLLABUS OF 4TH SEMESTER

Paper I/Subject Name: Computer Graphics		Subject Code: CSE022C401
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.

Prerequisites: Concepts of Computer Programming and Basic Mathematics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Illustrate** pictures for presentations	**BT 2**
CO 2	**Apply** the concepts learnt to implement various shape drawing algorithms, 2D/3D transformations, homogeneous coordinates and viewing.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Basics of Computer Graphics and Multimedia**	Display Devices: Line and point plotting systems; raster, vector, pixel and plotters, Continualrefresh and storage displays, Digital frame buffer, Plasma panel displays, Very high resolutiondevices, High-speed drawing, Display processors, Character generators, Colour-displaytechniques (Shadow-mask and penetration CRT, colour look-up tables. analog false colours,hard-copy colour printers.) Basics of Multimedia, Multimedia Elements, Multimedia Applications, Multimedia System Architecture, Data Compression Techniques.	**9**
II	**Output Primitives, Illumination and Shading**	Points, Line Drawing Algorithms (DDA and Bresenham's Line Drawing Algorithm), Circle- Generating Algorithms (Bresenham's and Midpoint Circle Algorithms), Ellipse-Generating Algorithms (Midpoint Ellipse Algorithm only), Filled- Area Primitives: Scan–Line Polygon Fill Algorithm, Boundary-Fill Algorithm, Flood-Fill Algorithm. Background, simple lighting model, shading models, intensity	**9**

		representation, Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colourmodel	
III	**Two-Dimensional Transformation and Viewing**	Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shear, Transformations between Coordinates Systems, Raster Methods for Transformations. The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-View Port Coordinate Transformation, Clipping- Point, Line(Cohen-Sutherland Line Clipping and Liang –Barsky Line Clipping and Nicholl-Lee-Nicholl Line Clipping) and Polygon Clipping(Sutherland- Hodgeman Polygon Clipping, Weiler-Atherton Polygon Clipping).	**9**
IV	**Three-Dimensional Transformation, Viewing and Animation**	Translation, Rotation, Scaling, Reflection and Shears, Composite Transformations, Modeling and Coordinate Transformations. Viewing Pipeline, Viewing Coordinates, Projections and Clipping. Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening.	**9**
Total			**36**

Text Book:

1. *Computer Graphics*, C Version, Hearn D. , Baker M. P.; 2nd Edition, 2006; Pearson Education, New Delhi

Reference Books:

1. Plastock R.A. et.al; *Computer Graphics*, Schaums Outline Series; 2nd Edition; 2006; TMH, New Delhi.
2. Foley J.D.; *Computer Graphics*; 2nd Edition; 2004; Pearson Education; New Delhi

Paper II/Subject Name: OOP using C++		Subject Code:CSE022C402
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students understand how C++ improves C with object-oriented features and to explain problem solving and programming skills in C++ with extensive programming projects.

Prerequisites: Fundamentals of Computer Programming

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basic concepts of OOP.	**BT 2**
CO 2	**Apply**the concepts learnt to write efficient programs in C++.	**BT 3**
CO 3	**Analyze** a problem and construct a C++ program that solves it.	**BT 4**
CO 4	**Assess** a C++ program and describe ways to improve it.	**BT 5**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Introduction, Need, Characteristics, Difference between POP and OOP, Basic concepts of OOP, Features, Applications of OOP. Revision of topics like data types, keywords, identifiers, tokens, reference variables, different operators, conditional and loop control structures.	**9**
II	**Classes and Objects**	Definition of class, object, Difference between class and structure, class definitions, member functions, access specifiers.Objects Dynamic Creation and initialization, Passing and Returning objects, Object assignment and array of objects. Constructors Types, Destructors, Nesting member function, Private memberfunction , Inline functions. Static class members, Function prototyping, Call by reference, Return by reference, Default Argument, Friend functions, this pointer.	**9**
III	**Inheritance and Polymorphism**	Types of Inheritance; Base and Derived classes, Syntax of derived classes, access to the base class; Types of Inheritance, Multiple inheritance, Virtual Base classes, Constructors and Destructors in Inheritance, Container classes, Abstract Classes. Polymorphism: Compile time(Early/Static binding), Overloading functions and operators,Overloading new and delete operators, Run time polymorphism(Late/Dynamic Binding), Virtual	**9**

		functions, Pure Virtual functions, Virtual Destructors, Review of Virtual base classes,	
IV	**Templates, Exception and File Handling**	Templates–Uses, Generic classes, Class templates, Function templates, Advance templates. Examples. Exception handling-Advantages, Try catch and throw clauses, Examples,Manipulators, different examples of manipulators. Pointer types-uses; Dynamic memory allocation techniques, garbagecollection, Linked list, generic pointers; FilesOpen, Close, Read and Write; File attributes, File management	**9**
		TOTAL	**36**

Text Books:

1. *Object Oriented Programming With C++,* E. Balaguruswamy, 4th Edition, 2011,Tata McGraw Hill.
2. C++, *The Complete Reference,* Herbert Schildt, 4th Edition, 2017, McGraw Hill Education.

Reference Books:

1. Deital And Deital, *C++ How To Program,* 9th Edition, 2016, Pearson Education India.
2. R. Lafore, *Object Oriented Programming In Turbo C++*, 4th Edition, 2013, Galgotia, New Delhi

Paper III/Subject Name: Database Management Systems		Subject Code:CSE022C403
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students learn about databases and the process of designing and constructing data models.

Prerequisites: C/C++, Concepts of Data Structures.

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basic concepts and applications of database systems	**BT 2**
CO 2	**Apply** the basic concepts of MySql and write queries using it.	**BT 3**
CO3	**Analyze** the designed database for normalization.	**BT 4**
CO 4	**Evaluate** the process of transaction processing and concurrency control	**BT 5**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Basic Concepts**	Purpose of database systems-Components of DBMS –DBMS Architecture-Three Tier Architecture, and Data Independence-Data modelling -Entity Relationship Model and Diagram, Relational –Network-Hierarchical and object oriented models-Data Modelling using the Entity Relationship Model.	**9**
II	**Structure of Relational Databases**	Relational databases –relational algebra-relational calculus, tuple and domain calculus. Data definition with SQL, insert, delete and update statements in SQL –views –data manipulation with SQL. assertions –triggers, Cursors	**9**
III	**Database Design**	Design guidelines–Relational database design –IntegrityConstraints –Domain Constraints-Referential integrity –Functional Dependency-Normalization using Functional Dependencies, Normal forms based on primary keys-general definitions of Second and Third Normal Forms. Boyce-Codd Normal Form–Multi-valuedDependencies and Forth Normal Form –Join Dependencies and Fifth Normal Form –Pitfalls in Relational Database Design, Properties of Relational Decomposition, Dependency Preserving Property, Lossless Non-Additive Join Property, Testing Relational Decompositions for	**9**

		non-additive and dependency preserving properties.	
IV	**Introduction to Transaction and Query Processing**	Transaction and System Concepts-Desirable properties of Transactions-Schedules and Recoverability-Serializability ofSchedules -Concurrency Control–Data Storage Indexing and Query processing and Optimization MySQL case study: The basic structure of the MySQL system database structureand itsmanipulation in MySQL -storage organization in MySQL -Programming in PL/SQL-Cursor in PL/SQL	**9**
		TOTAL	**36**

Text Books:

1. *Fundamentals of Database System,*Elmasri and Navathe, 7thEdition, 2016, Pearson Education Asia
2. *Database System Concepts*, Henry F Korth, Abraham Silberschatz, 6thEdition, 2013, Mc Graw Hill.
3. *DataBase Management System*, Paneerselvam, 2nd Edition, 2011, PHI Learning

Reference Books:

1. C.J.Date*, An Introduction to Database Systems,*8thEdition, 2003, Pearson Education Asia
2. Bibin C. Desai, *An Introduction to Database Systems*, Revised Edition, 2012, Galgotia Publications

Paper IV/Subject Name: Finite Language and Automata		Subject Code:CSE022C404
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to impart knowledge on regular grammars, regular expressions and to teach about the basics of parsing and ambiguity.

Prerequisites: Fundamentals of Set Theory

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** theutility and importance of Automata Theory as the basis of all computer science languages design	**BT 2**
CO 2	**Construct** minimized sample automata andgrammars of context free languages	**BT 3**
CO3	**Analyze** the power and limitation of a computer and solve the problems using formal language	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Basics of Strings and Alphabets, DFA, transition graphs, regular languages, non-deterministic FA, equivalence of DFA and NDFA	**12**
II	**Grammars**	Regular grammars, regular expressions, equivalence between regular languages, properties of regular languages, pumping lemma.	**12**
III	**Deterministic and Non-Deterministic PDA**	Leftmost and rightmost derivation, parsing and ambiguity, ambiguity in grammar and languages, normal forms. NDPDA, DPDA, context free languages and PDA, comparison of deterministic and non-deterministic versions, closure properties, pumping lemma for CFL	**12**
IV	**Turing Machine**	Turing Machines, variations, halting problem, PCP Chomsky Hierarchy Manipulators, different examples of manipulators; Pointer types- uses; Dynamic memory allocation techniques - garbage collection, Linked list, generic pointers; Files- Open, Close, Read and Write; File attributes, File management	**12**

		TOTAL	**48**

Text Books:

1. *An Introduction to Formal Languages and Automata* , Peter Linz, 3rdEdition , 2010, Narosa Publishers

Reference Books:

1. J. E. Hopercroft and J. D. Ullman,*Introduction to Automata Theory, Languages & Computation*, 3rd Edition, 2006, Narosa
2. J. C. Martin, *Introduction to Languages and The Theory of Computation,* 3rd Edition, 2009,McGraw Hill International Edition.

Paper V/Subject Name: Principles of Management and Organizational Behavior Subject Code:BSA022C301		
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to make the students understand about the principles of management and their application to the functioning of an organization.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the managerial functions like planning, and have same basic knowledge on international aspect of management	**BT 2**
CO 2	**Build** the ability to direct, leadership and communicate effectively	**BT 3**
CO3	**Analyse** the behaviour of individuals and groups in organisations in terms of the key factors that influence organisational behaviour.	**BT 4**
CO 4	**Assess** the potential effects of organizational-level factors (such as structure, culture and change) on organizational behaviorr	**BT 5**

Detailed Syllabus:

Modules	**Topics**	**Course content**	**Periods**
I	**Introduction To Management and Organizations**	Definition of Management – Science or Art, Manager vs. Entrepreneur, types of managers, managerial roles and skills. Evolution of Management-Scientific, human relations, system and contingency approaches, Types of Business organization, Sole proprietorship, partnership, company public and private sector enterprises, Organization culture and Environment, Current trends and issues in Management.	**9**
II	**Planning and Decision Making**	Nature and purpose of planning, planning process, types of planning, objectives, setting objectives, policies. Planning premises, Strategic Management, Planning Tools and Techniques, Decision making steps and process.	**9**
III	**Organization and Human Resource Management**	Organizing- Nature and purpose, Formal and informal organization, organization chart, organization structure, types, Line and staff authority, departmentalization, delegation of authority, centralization and decentralization, Job Design. Human Resource Management- HR Planning, Recruitment,	**9**

		selection, Training and Development, Performance Management, Career planning and management.	
IV	**Direction and Control**	Directing-Foundations of individual and group behaviour, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment. Leadership- types and theories of leadership, communication, process of communication, barrier in communication, effective Communication, Communication and IT. Controlling- System and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in Management control, Productivity problems and management, control and performance, direct and preventive control, reporting.	**9**
		TOTAL	**36**

Text Books:

1. *Management,* Stephen P. Robbins and Mary Coulter, 13th Edition, 2017, Prentice Hall India Pvt. Ltd.
2. *Fundamentals of Management,* Stephen A. Robbins, David A. Decenzo and Mary Coulter, 9th Edition, 2016, Pearson Education India.

Reference Books:

1. Robert Kreitner and Mamata Mohapatra,*Management*, 1st Edition, 2008, Dreamtech Press.
2. Harold Koontz and Heinz Weihrich, *Essentials of Management: An International, Innovation and Leadership Perspective,* 10th Edition, 2015,Tata McGraw Hill.
3. Tripathy P. C. & Reddy P. N., *Principles of Management*, 4th Edition, 2010, Tata McGraw Hill.
4. J. P. Pathak, *Fundamentals of Management,* 1st Edition, 2014, Vikas Publishing House.
5. Robert N. Lussier, *Management Fundamentals Concepts, Applications, Skill Development,*5th Edition, 2012, Cengage Publications.

Paper VI/Subject Name: OOP using C++ Lab		Subject Code:CSE022C412
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are to make the students understand object-oriented programming and advanced C++ concepts and improve the problem analyzing and solving skills.

Prerequisites: Fundamentals of Computer Programming

Detailed Syllabus:

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Interpret** the basic concepts of OOP.	**BT 2**
CO 2	**Solve** problems by writing C++ programs.	**BT 3**
CO3	**Analyze** and **evaluate** programs for its efficiency.	**BT 4& 5**

Minimum 20 experiments need to be done based on the following:

1. Write a C++ program to display "HELLO WORLD".
2. Write a C++ program that will ask the temperature in Fahrenheit and display in Celsius
3. Write a C++ program to print the following output using forloop.

   1
   2 2
   3 3 3
   4 4 4 4
4. Write a C++ program to reverse a number using do-whileloop
5. Write a C++ program to find out the factorial of a number using while loop
6. Write a C++ program to read an integer array and display it.
7. Write a C++ program to read a character array and display it.
8. Write a C++ program to find out the maximum of three number using if-elsestatement
9. Write a C++ program to implement the concept of static data member in class.
10. Write a C++ program to implement the concept of static function in class.
11. Write a C++ program using function with default argument.
12. Write a C++ program to illustrate the use of objects as function arguments (which performs the addition of time in the hour and minutes format)

13. Write a C++ program to illustrate the use of friend function.
14. Write a C++ program to illustrate how an object can be created (within a function) and returned to another function
15. Write a C++ program to illustrate the use of constructors and destructors.
16. Write a C++ program to illustrate the use of copy constructor.
17. Write a C++ program to implement single inheritance (private/public)
18. Write a C++ program to implement multilevel inheritance
19. Write a C++ program to implement multiple inheritances.
20. Write a C++ program to illustrate the use of virtual base class.
21. Write a C++ program to overload unary minus operator
22. Write a C++ program to overload binary „+" operator
23. Write a C++ program to illustrate how an operator can be overloaded using friend function.
24. Write a C++ program to illustrate the use of run time polymorphism.
25. Write a C++ program to swap two variable using function template
26. Write a C++ program to implement try(), catch(), throw()function.
27. Write a C++ program to implement this pointer
28. Write a C++ program to illustrate the use of pointers to derived objects
29. Write a C++ program to illustrate the use of virtual function
30. Write a C++ program to open and close a file using open(), close() function
31. Write a C++ program to illustrate the use of read(), write() function

Text Books:

1. *Object Oriented Programming With C++,* E. Balaguruswamy, 4th Edition, 2011,Tata McGraw Hill.
2. C++, *The Complete Reference,* Herbert Schildt, 4th Edition, 2017, McGraw Hill Education.

Reference Books:

1. Deital And Deital, *C++ How To Program,* 9th Edition, 2016, Pearson Education India.
2. R. Lafore, *Object Oriented Programming In Turbo C++*, 4th Edition, 2013, Galgotia, New Delhi

Paper VII/Subject Name: Database Management Systems Lab		Subject Code:CSE022C413
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course to teach the student database design and query processing through MySql.

Prerequisites: C/C++, Concepts of Data Structures

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Illustrate** a database schema for a given problem-domain.	**BT 2**
CO 2	**Build** queries in MySql with the concepts learnt.	**BT 3**
CO3	**Analyze and evaluate** the queries for its correctness.	**BT 4 & 5**

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Programs to understand the functionality and limitations of file system.
2. Consider the following relational schema
   Employee (Emp_no, Name, Salary, design, dept_id, DOJ)
   Department (Dept_id, DName, loc, DOE)
   a. Display the name of the employees working in marketing dept.
   b. Display the details of the employee joined in the month of July.
   c. Display the details of the employee who gets maximum salary.
   d. Count the no of employees in each department
3. Consider the following relational schema
   Student (Rollno, Name, Address, DOB, C_id)
   Course (C_id, Cname, Dur, Fees)
   a. Display rollno,name,cname,fees of each student
   b. Count the no of students in each course
4. Consider the following relational schema
   Books(book_id,b_name,author,purchase_date,cost)
   Members(member_id,m_name,address,phone,birthdate)
   Issue_return(book_id,member_id,issue_date,return_date)

   a. Find the author of the books that have not been issued.

b. Display the member_id and no of books issued to that (Assume that if a book in Issue_Return relation does not have a return_date then it is issued)
c. Find the book that has been issued the minimum no of times.
d. Display the names and author of the books that have been issued at any time to a member whose name begins with "Ra".
e. Display the name and Cost of those books that have been issued to any member whose date of birth is less than 01-01-1989 but not been issued to any member having the birth date equal to or greater than 01-01-1989.

5. Consider the following relational schema

Student(name,phone,dob,s_id)
Course(c_id,cname,credit,teacher_id)
Result(s_id,c_id,mark)

a. Find the name of the students whose results are not declared in any course
b. Find the teachers who are teaching more than one course
c. Display the name and marks of those students who were born before 1-1-1989 and score more than 80 marks in any course
d. Find the details of students securing pass marks in more than 3 course
e. Find the total no of credits earned by a students whose id is 10.
f. Find name of the students who got maximum overall marks.
g. Display the name and marks of those students who scored more than 80 marks in any subject.
h. Find the details of the students securing less than 30 marks in more than 3 subjects.

6. Consider the following relational schema

Customer(C_id, Name , Address)
Item(i_code , Name , Price)
Purchase (P_id ,C_id , I_code, qty , pdate)

a. Find the name of the customer who has done maximum purchase.
b. Display the name of the item that has been purchased maximum no of times in the month of Feb.
c. Display the name of the customer who didn't purchase any item.

7. Create three triggers (insert, delete and update) on emp table so that:
a. Whenever a new record is inserted then the emp_id and date of insertion is stored in another table called new_rec.
b. Whenever a record is deleted the emp_id and date of deletion is stored in another table called old_rec.
c. Whenever employee's salary is updated the emp_id , old salary and updated salary is stored in another table called update_info.
8. Write a procedure to accept aemp_id and display the employee details.
9. Write a procedure to accept aemp_id and return the employee salary.
10. Given,

Emp(emp_no,name,salary,supervisor_no,dept_code)
Dept(dept_code, dept_name)

a. employees who get more salary than their supervisor
b. Department name and total number of employees in each Department.
c. Name and department of employee(s) who earn maximum salary.

11. Programs on Views and Cursors

Text Books:

1. *Fundamentals of Database System,*Elmasri and Navathe, 7thEdition, 2016, Pearson Education Asia
2. *Database System Concepts*, Henry F Korth, Abraham Silberschatz, 6thEdition, 2013, Mc Graw Hill.
3. *Introduction to Database Management System*, Atul Kahate, 1st Edition, 2004, Pearson Educations
4. *DataBase Management System*, Paneerselvam, 2nd Edition, 2011, PHI Learning

Reference Books:

1. C.J.Date, *An Introduction to Database Systems,*8th Edition, 2003, Pearson Education Asia
2. Bibin C. Desai, *An Introduction to Database Systems*, Revised Edition, 2012, Galgotia Publications

Paper VIII/Subject Name: Communication and Presentation Skills		**Subject Code:CEN982A401**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: TP**

Objective:

The objectives of the course are to prepare students to develop report writing skills, deliver effective presentation and be informed about technology-enabled communication in the 21st century.

Prerequisites: Basic writing skills in English.

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Interpret** the skills required for giving presentations.	**BT 2**
CO 2	**Build** reports, make presentations and have basic understanding of technology-enabled communication in the 21st century.	**BT 3**

Detailed Syllabus:

Modules	**Topics**	**Course content**	**Periods**
I	**Writing Reports, Business Proposals and Business Plans**	Formats of reports Developing a report outline Report planning Writing a report Using different visual representations for writing a report Developing an outline for a business proposal Developing an outline for business plan	**3**
II	**Designing and Developing Business Presentations**	Planning an effective Business Presentation, Organising the content Designing compelling presentation visuals Refining your delivery Special presentation situations	**3**
III	**Focusing on Group Communication**	Increasing focus on groups Characteristics of Effective Groups Group Conflicts Meeting Management	**3**
IV	**Technology Enabled Communication**	Role of Technology-enabled communication in the 21st century businesses Different forms of technology-enabled communication tools used in organisations Telephone, Teleconferencing, Fax, Email, Instant messaging , Blog, podcast, Videos, videoconferencing, social media	**3**
Total			**12**

Text Book:

1. *Business Communication: Essential Strategies for twenty-first century Managers,* Verma, Salini. 2nd Edition, 2015, Vikas Publishing House Pvt Ltd. pp 267-298, 243-259.

Reference Books:

1. Lehman, Dufrene, Sinha, *BCOM: An Innovative Approach to learning and teaching Business Communication,*2011, Cengage Learning Pvt.Ltd.pp. 50-63, 302-322.

17. DETAILLED SYLLABUS OF 5TH SEMESTER

Paper I/Subject Name: Operating Systems		**Subject Code:CSE022C501**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to teach the basic concepts and functions of operating systems and make them understand the principles of concurrency.

Prerequisites: Concepts of Computer Organization and Architecture

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basic concepts of Operating systems.	**BT 2**
CO 2	**Apply** the principles of scheduling, and concurrency to solve various problems.	**BT 3**
CO 3	**Analyze** and **evaluate** the execution of simultaneous processes for deadlock.	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Operating Systems Overview**	Introduction and history of Operating systems, structure and operations; processes and files. **Computer System Overvie**w- Basic Elements, Instruction Execution, Interrupts Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. **Operating system overview**-objectives and functions, Evolution of Operating System.- Computer System Organization- Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot	**9**

II	**Process Management And Concurrency Control**	**Processes**-Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; Threads- Overview, Multicore Programming, Multithreading Models; Thread and SMP Management. **Process Synchronization** – Critical Section Problem, Mutex Locks, Semaphores, Monitors; CPU Scheduling and scheduling algorithms. **Deadlocks**- Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms	**9**
III	**Storage Management**	Memory Management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging, Virtual Memory: Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing. 32 and 64 bit architecture Examples; Allocating Kernel Memory, OS Examples	**9**
IV	**I/O and File Systems**	I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Overview of mass storage structure- disks and tapes. Disk structure – accessing disks, Swap Space. Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache. Disk Protection–Goals, Principles, Domain. **File System Interface**: File Concepts – Attributes – operations – types – structure – access methods. File system mounting. Protection. File system implementation. Directory implementation – allocation methods. Free space Management.	**9**
TOTAL			**36**

Text Books:

1. *Operating System Concepts,*Abraham Silberschatz, Peter Baer Galvin and Greg Gagne*,* 9thEdition, 2012, John Wiley and Sons Inc.

Reference Books:

1. William Stallings, *Operating Systems – Internals and Design Principles*, 7thEdition, 2011, Prentice Hall.
2. Andrew S. Tanenbaum, *Modern Operating Systems*, 2ndEdition, 2001, Addison Wesley.
3. D M Dhamdhere, *Operating Systems: A Concept-Based Approach*, 2nd Edition, 2007, Tata McGraw-Hill Education.

Paper II/Subject Name:Software Engineering		Subject Code: CSE022C502
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to explain the fundaments of software engineering principles and practices, including project management, configurations management, requirements definition, system analysis, design, testing, and deployment.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** the various phases of project development.	**BT 2**
CO 2	**Select** appropriate process model for development depending on the user requirements.	**BT 3**
CO 3	**Analyze** and **assess** the model developed in terms of risks management and reuse.	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction to Process Models and Software Requirement Specification**	Importance of Software Project Management, Activities Methodologies, Categorization of Software Projects, Setting objectives, Software life cycle models: Waterfall, prototyping, Evolutionary,Spiral models and Agile Model. Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies,	**12**

		requirements elicitation and analysis, requirements validation, requirements management.	
II	**Software Process Management, Activity Planning and Agile Development**	Project planning and control, Effort and Cost estimation techniques-LOC, Function Point, COCOMO, project scheduling using PERT and GANTT charts, Critical path (CRM) method, cost-time relations: Rayleigh-Norden results,Staffing Pattern,Software configuration management, Introduction to Agility- Agile methods – Extreme Programming – SCRUM – Managing interactive processes.	**12**
III	**Software Design and Risk Estimation**	Basics of Software Design, Procedural Design Methodology, Modularity, Cohesion, Coupling, DFD and Structure Chart, Object-Oriented concepts, Introduction to UML: Class and interaction Diagrams, Object-Oriented Analysis and Design, Object-oriented Software Modelling. Risk Management-Risk Identification, Risk Assessment, Risk Containment	**12**
IV	**Software Testing, Maintenance and Reuse**	Software testing fundamentals-Internal and external views of Testing-white box testing – basis path testing-control structure testing-black box testing-Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering. Characteristics of Software Maintenance, Software Reverse Engineering, Software Maintenance Process Models, Estimation of maintenance cost, Software Reuse.	**12**
Total			**48**

Text Book:

1. *Software Project Management,* Bob Hughes, Mike Cotterell and Rajib Mall, 5th Edition, 2012, Tata McGraw Hill, New Delhi

Reference Books:

1. Kieron Conway, *Software Project Management: From Concept to Deployment,* 1st Edition, 2000, Dreamtech Press.
2. S. A. Kelkar, *Software Project Management: A Concise Study,* 3rd Edition, 2012, PHI Publication.

Paper III/Subject Name: Principles of Programming Languages		Subject Code:CSE022C503
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to explain about the major programming paradigms, syntax and semantics, and the principles and techniques involved in design and implementation of modern programming languages.

Prerequisites: Fundaments of Procedural and Object-Oriented Programming

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate**the various syntax and semantics of different programming languages	**BT 2**
CO 2	**Experiment with**the data, data types, and basic statements of various programming languages	**BT 3**
CO 3	**Analyze**and **assess** each of the paradigms of programming for their suitable applications.	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Elements of Programming Languages**	Reasons for studying, concepts of programming languages, Language Evaluation Criteria, influences on Language design, Language categories. Programming Language Implementation – Compilation, Hybrid Implementation, Pure Interpretation and Virtual Machines. Describing Syntax and Semantics -Introduction - The General Problem of Describing Syntax-Formal Methods of	**9**

		Describing Syntax - Attribute Grammars - Describing the Meanings of Programs: Dynamic Semantics	
II	**Data Types, Sub-programs and Blocks**	**Introduction**, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation use related to these types. Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants, variable initialization. **Expressions and Statements:** Arithmetic relational and Boolean expressions, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, guarded commands. **Fundamentals of sub-programs**, Scope of life time of variables, static and dynamic scope, design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are sub-program names, design issues for functions user defined overloaded operators, co routines.	**9**
III	**Functional and Logic Programming**	**Functional Programming-**Introduction- Mathematical Functions- Fundamentals of Functional Programming Languages- The First Functional Programming Language: LISP- An Introduction to Scheme- Common LISP- Haskell-F# - ML: Implicit Types- Data Types- Exception Handling in ML. Functional Programming with Lists- Scheme, a Dialect of Lisp- The Structure of Lists- List Manipulation- A Motivating Example: Differentiation- Simplification of Expressions- Storage Allocation for Lists.**Logic Programming-** Relational Logic Programming- Syntax- Basics- Facts- Rules- Syntax- Operational Semantics- Relational logic programs and SQL operations- Logic Programming- Syntax- Operational semantics- Data Structures-Meta-tools: Backtracking optimization (cuts); Unify; Meta-circular interpreters- The Origins of Prolog- Elements- of Prolog-Deficiencies of Prolog- Applications of Logic Programming	**9**
IV	**Concurrent Programming**	Parallelism in Hardware- Streams: Implicit Synchronization- Concurrency as Interleaving- Liveness Properties- Safe Access to Shared Data- Concurrency in Ada- Synchronized Access to Shared Variables- Synthesized Attributes- Attribute Grammars- Natural Semantics- Denotational Semantics -A Calculator in Scheme- Lexically Scoped Lambda Expressions- An Interpreter-Recursive Functions.	**9**
		TOTAL	**36**

Text Books:

1. *Concepts of Programming Languages,* W. Sebesta, 8th Edition, 2008, Pearson Education.
2. *Programming Language Design Concepts*, D. A. Watt,1st Edition, 2004, John Wiley, 2004.

Reference Books:

1. Ghezzi, *Programming Languages*, 3rdEdition, 2008, John Wiley
2. John C. Mitchell, *Concepts in Programming Language*, 1st Edition,2002, Cambridge University Press.
3. Kenneth Louden, *Programming Languages: Principles and Practices*, 3rdEdition, 2012, Cengage Learning.
4. Robert W. Sebesta, *Concepts of Programming Languages*, 10th Edition, 2002, Pearson Education.

Paper IV/Subject Name: Graph Theory		**Subject Code:CSE022C504**
L-T-P-C – 4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to explain the fundamental concepts in graph theory such that it can be used to solve practical problems.

Prerequisites: Concepts of Data Structures and Discrete Mathematics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** mathematical definitions of objects in graph theory.	**BT 2**
CO 2	**Apply** mathematical concepts to solve graph-related problems.	**BT 3**
CO3	**Utilize** a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.	**BT 3**
CO 4	**Analyze** and critically assess a mathematical proof.	**BT 4**

Detailed Syllabus:

Modules	**Topics**	**Course Contents**	**Hours**

I	**Introduction**	Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits –Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees..	**9**
II	**Trees, Connectivity and Planarity**	Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planer graphs – Different representation of a planer graph.	**9**
III	**Matrices, Coloring and Directed Graphs**	Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.	**9**
IV	**Permutation, Combination and Generating Functions**	Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions. Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.	**9**
TOTAL			**36**

Text Books:

1. *Graph Theory: With Application to Engineering and Computer Science*, Narsingh Deo, New Edition, 2009, Prentice Hall of India.
2. *Discrete and Combinatorial Mathematics: An Applied Introduction*, Grimaldi R.P., 5th Edition, 2006, Addison Wesley.

Reference Books:

1. Clark J. and Holton D.A, *A First Look at Graph Theory*, Allied Publishers.
2. Mott J.L., Kandel A. and Baker T.P. *Discrete Mathematics for Computer Scientists and Mathematicians*, 2008, Prentice Hall of India.
3. Liu C.L., *Elements of Discrete Mathematics*, 4thEdition, 2017, McGraw Hill.
4. Rosen K.H., *Discrete Mathematics and Its Applications*, 7th Edition, 2007, McGraw Hill

Paper V/Subject Name: Constitution of India		Subject Code:POL022S503
L-T-P-C – 1-0-0-1	Credit Units: 01	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students understand the making of the Constitution of India and its salient characteristics. The Objectives shall be achieved by dealing with the understanding of the concept like organs of the government.

Prerequisites: Understanding of the Indian Government

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the nature of the Constitution of India.	**BT 2**
CO 2	**Identify**the organs of the government, local administration as well as Election Commission of India.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course Content	Periods
I	**Introduction**	**Making of the Indian Constitution:**Salient Features, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	**3**

II.	**Organsof the Governme nt**	**Legislature**: Parliament and State legislature **Executive**: President, Prime Minister, Chief Minister, Governor **Judiciary:** Features, Independence of Judiciary, Supreme Court and High Court.	**3**
III.	**Local Administr ation**	**Constitutional Development in Local Administration**: 73rd and 74th Constitutional Amendment Act **Grassroots Democracy**: Importance and Challenges	**3**
IV.	**Election Commission**	**Election Commission**: Role and Functioning, Chief Election Commissioner and Election Commissioners **State Election Commission**: Role and Functioning,	**3**
TOTAL			**12**

Text Books

1. *The Indian Constitution: Cornerstone of a nation*, Austin G., 2nd Edition, 2013, Oxford University press, New Delhi
2. *Politics in India: Issues, Institutions, Processes*, Dutta ,A.R.,2013,Arun Prakashan, Guwahati

Reference Books:

1. Laxmikanth, M.; "*Indian Polity*", 2016, MC Graw Hill Education
2. Fadia,B.L.&Fadia, Kuldeep; "*Indian Government and Politics*," 2017 Sahitya Bhawan

Paper VI/Subject Name: Operating Systems Lab		**Subject Code:CSE022C511**
L-T-P-C – 0-0-4-2	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are to make the students learn about process and disc scheduling practically along with the working of system calls.

Prerequisites: Fundamentals of Computer Programming

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** and implement basic services and functionalities of the operating system using system calls.	**BT 2**
CO 2	**Utilize** modern operating system calls and synchronization libraries in software/ hardware interfaces.	**BT 3**
CO 3	**Analyze** various Scheduling algorithms to better usage of the CPU.	**BT 4**

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

1. Basic Linux Commands and Overview.
2. Write Shell Script for followings
    - To find the global complete path for any file.
    - To broadcast a message to a specified user or a group of users logged on any terminal.
    - To copy the file system from two directories to a new directory in such a way that only the latest file is copied in case there are common files in both the directories.
    - To compare identically named files in two different directories and if they are same, copy one of them in a third directory
    - To delete zero sized files from a given directory (and all its sub- directories).
    - To display the name of those files (in the given directory) which are having multiple links.
    - To display the name of all executable files in the given directory.
    - Write a script to display the date, time and a welcome message (like Good Morning etc.). The time should be displayed with "a.m." or "p.m." and not in 24 hours notation.
    - Write a script to display the directory in the descending order of the size of each file.
3. Implementation ofFCFS (First Come First Serve) CPU Scheduling.
4. Implementation ofSJF (Shortest Job First) CPU Scheduling.
5. Implementation of Round Robin (RR) CPU Scheduling.
6. Implementation ofPriority CPU Scheduling Algorithm.
7. Implementation ofFIFO Replacement Algorithm.
8. Implementation of Optimal Page Replacement Algorithm.
9. Implementation of LRU Page Replacement Algorithm by Stack method
10. Implement the producer-consumer problem using threads.

Text Books:

1. *Operating System Concepts,*Abraham Silberschatz, Peter Baer Galvin and Greg Gagne*,* 9th Edition, 2012, John Wiley and Sons Inc.

Reference Books:

1. William Stallings, *Operating Systems – Internals and Design Principles*, 7thEdition, 2011, Prentice Hall.
2. Andrew S. Tanenbaum, *Modern Operating Systems*, 3rd Edition, 2009, Addison Wesley.
3. D M Dhamdhere, *Operating Systems: A Concept-Based Approach*, 2nd Edition, 2007, Tata McGraw-Hill Education.

Paper VII/Subject Name: Principles of Programming Languages Lab		Subject Code:CSE022C512
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are to make the students understand the syntax and semantics, datatypes, bindings of various programming languages.

Prerequisites: Concepts of C and C++

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** the working of various programming paradigms.	**BT 2**
CO 2	**Apply** the concepts learnt to solve problems with the suitable paradigm and language.	**BT 3**
CO 3	**Experiment with** different paradigms to solve a particular problem.	**BT 3**

Detailed Syllabus:

Minimum 20 Laboratory Experiments based on the following:

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (Ifx> y return $x^2 - y^2$, otherwise $y^2 - x^2$).
3. Define a Recursive LISP function to compute factorial of a given number.
4. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (Do not use last predicate)
5. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (Do not use reverse predicate).
6. Use Prolog to find the sum of numbers from 1 to N.
7. Use Prolog to find factorial of a number.
8. Use Prolog to show how to implement a for loop in a program.
9. There are ice-cream cones with three scoops of ice-cream. There is chocolate, vanilla, and strawberry ice-cream. Any mixture of three is ok. But it should be a different cone each time. How many different cones are there? Use Prolog to give a solution to this.
10. Implement quick sort algorithm using C++
11. Write a program to implement a queue using two stacks in C++.
12. Implement Kruskal's/Prim's algorithm using C++.
13. Write a Python program to shuffle a deck of cards.
14. Write a program in Python to find the size of an image.
15. Write a program in Python to reverse a single linked list.

Text Books:

1. *Concepts of Programming Languages,* W. Sebesta, 8th Edition, 2008, Pearson Education.
2. *Programming Language Design Concepts*, D. A. Watt,1st Edition, 2004, John Wiley, 2004.

Reference Books:

1. Ghezzi, *Programming Languages*, 3rdEdition, 2008, John Wiley
2. Kenneth Louden, *Programming Languages: Principles and Practices*, 3rdEdition, 2012, Cengage Learning.
3. Ravi Sethi, *Programming Languages: Concepts and Constructs*, 2ndEdition, 1996, Addison Wesley.
4. Robert .W. Sebesta, *Concepts of Programming Languages*, 10th Edition, 2012, Pearson Education.

***** Note: For detailed syllabus for Other School Open Elective-I subjects offered by CSE Department, please check the 'Detailed Syllabus of Other School Open Electives' section below.**

Paper IX/Subject Name: Ethics and Business Communication		**Subject Code:CEN982A501**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: TP**

Objective:

The objectives of the course are to introduce students to truthfulness, accuracy, honesty, and reason as essential to the integrity of communicationskills to make moral decisions.

Prerequisites: Previous knowledge of communication

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate**ethical awareness and the ability to do ethical reflection.	**BT 2**
CO 2	**Apply** ethical principles in decision-making	**BT 3**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Why ethics in organizational communication?**	Characteristics of Ethical Communication, ethical code in communication, Ethical Perspectives)values, religious, economic, legal, utilitarian, humanistic, dialogic, situational, universalistic), Ethical issues involved in Business communication (honesty, respect, sensitivity to cultural differences)	**3**
II	**What does a professional communicator do?**	Practices and behaviours of a professional communicator, ethical dilemmas (secrecy, whistle blowing, leaks, rumours and gossips, Lying, ambiguity), Strategic approaches to corporate ethics, Ethical communication on the intern	**3**
III	**Areas of Concern**	Ethical communication on the internet, freedom of expression, ethical implication of privacy of electronic mail, Ethics in advertising, Advertising and social responsibility, plagiarism, Social Media and responsible handling.	**3**
IV	**Corporate image, PR, CSR and Advertising**	Employee relations and employee communication – key tasks and communicative objectives, forms of employee involvement and tools of communication, PR and corporate mission, Advertising, PR and Publicity, Corporate social responsibility, financial communication, customer relations,	**3**
TOTAL			**12**

Text Books:

1. *Business Communication*, Raman, Meenakshi and Singh, Prakash. 2nd Edition, 2012, Oxford University Press, pp. 546-585.
2. *Lean, Ethical Business Communication*, Sundararajan, Binod and Macdonald, Linda, 2017, Oxford University Press, pp 212 – 220.

Reference Books:

1. Sengupta. Sengupta, *Business and Managerial Communication*, 2nd Edition, 2011, Vikas Publishing House Pvt Ltd, pp. 529 – 603.

16. DETAILED SYLLABUS OF 6th SEMESTER

Paper I/Subject Name: Data Communication and Networks		**Subject Code:CSE022C601**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to make the students understand the significance and concepts of computer networks along with the layered architecture.

Prerequisites: Basics of internet technologies and graph theory

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the significance and concepts of computer networks	**BT 2**
CO 2	**Identify** the layered model for computer networking.	**BT 3**
CO 3	**Analyze** and **evaluate** basic protocols and design issues for layered model.	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Data Link Layer and Medium Access Sub-layer**	Design issues, Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP Static and dynamic channel allocation, Random Access: ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE 802.3 frame format, Ethernet cabling, Manchester encoding, collision detection in 802.3, Binary exponential back off algorithm	**9**
II	**Network Layer**	Design issues, IPv4 classful and classless addressing, subnetting, Routing algorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms	**9**
III	**Transport Layer**	Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and de-multiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison	**9**
IV	**Application Layer**	World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), SMTP, HTTP, Introduction to Network security	**9**
TOTAL			**36**

Text Books:

1. *Data and Computer Communication*, William Stallings, 10th Edition, 2013, PHI.
2. *Data Communications and Networking*, Behrouz A Forouzan, 4th Edition, 2017, Tata McGraw Hill
3. *Computer Networks*, Tannenbaum, 3rd Edition, 1996, Pearson Education.

Reference Books:

1. L.L. Peterson & B.S. Davie, *Computer Networks: A Systems Approach*, 5thEdition, 2011, Morgan Kaufmann
2. AnuranjanMisra, *Computer Networks*, 2006, Acme Learning, Morgan Kaufman Publication, New Delhi
3. BhushanTrivedi, *Computer Networks*, Reprint Edition, 2011, Oxford press

Paper II/Subject Name: Design and Analysis of Algorithms		Subject Code:CSE022C602
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to enable the students analyze performance of algorithms and solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking and branch and bound.

Prerequisites: Concepts of Data Structures and Basic Mathematics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the performance of algorithm.	**BT 2**
CO 2	**Apply** different designing methods for development of algorithms to realistic problems, such as divide and conquer, greedy and etc.	**BT 3**
CO 3	**Analyze** and **evaluate**algorithms to improve their efficiency.	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Introduction and Divide and Conquer**	Algorithm, Psuedo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation-Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis. Master's Theorem	**9**
II	**Searching and Traversal Techniques**	Efficient non - recursive binary tree traversal algorithm, Disjoint set operations, union and find algorithms, Spanning trees, Graph traversals - Breadth first search and Depth first search, AND / OR graphs, game trees, Connected Components, Bi - connected components. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and bi-connected components.	**9**
III	**Types of Problem Solving Techniques**	Greedy Method: General method, applications - Job sequencing with dead lines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem. Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 Knapsack problem, All pairs shortest path problem,Travelling sales person problem, Reliability design. Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles. Branch and Bound: General method, applications - Travelling sales person problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution	**13**
IV	**NP-Hard and NP-Complete Problems**	NP-completeness – Polynomial time verification – Theory of reducibility – Circuit satisfiability - NP-completeness proofs – NP-complete problems: Vertex cover, Hamiltonian cycle and Traveling Salesman problems – Approximation Algorithms – Approximation algorithms to vertex-cover and traveling salesman problems.	**5**
TOTAL			**36**

Text Book:

1. *Introduction to Algorithms,* T. H. Cormen, C. E. Leiserson, R. L. Rivest, 3rdEdition, 2009,The MIT Press, Cambridge, Massachusetts.

Reference Books:

1. Aho, Hopcroft & Ullman, *The Design and Analysis of Algorithms,*1974,Addison- Wesley
2. Horowitz &Sahani, *Fundamentals of Algorithms,* 2nd Edition, 2009, Galgotia Publications

Paper III/Subject Name: Compiler Design		Subject Code:CSE022C603
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to provide the basic concept of compiler design and make the students understand concepts of lexical analyzer, code generation and code optimization techniques.

Prerequisites: Concepts of Formal Language and Automata Theory

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the different phases and passes of the compiler	**BT 2**
CO 2	**Utilize** the compiler tools like LEX, YACC, etc	**BT 3**
CO 3	**Analyze** and **assess** the optimized codes to check for satisfiability of each and every grammar.	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours

I	**Introduction**	Overview of the Translation Process, A Simple Compiler, Difference between interpreter, assembler and compiler. Overview and use of linker and loader, types of Compiler, Analysis of the Source Program, The Phases of a Compiler, Cousins of the Compiler, The Grouping of Phases, Lexical Analysis, Hard Coding and Automatic Generation Lexical Analyzers, Front-end and Back-end of compiler, pass structure	**9**
II	**Lexical Analyzer and Parsing Theory**	Introduction to Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzers, Finite Automata from a Regular Expression, Design of a Lexical Analyzer Generator, Optimization of DFA, Top Down and Bottom-up Parsing Algorithms, Top-Down Parsing, Bottom-Up Parsing, Operator-Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators, Automatic Generation of Parsers. Syntax-Directed Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions, and syntax directed definitions and translation schemes.	**9**
III	**Intermediate Code Generation and Run-Time Memory Management**	Different Intermediate Forms, Syntax Directed Translation Mechanisms and Attributed Mechanisms and Attributed Definition, Source Language Issues, Storage Organization, Storage-Allocation Strategies, and Access to Non local Names, Parameter Passing, Symbol Tables, and Language Facilities for Dynamic Storage Allocation, Dynamic Storage Allocation Techniques. Error Detection & Recovery, Ad-Hoc and Systematic Methods	**9**
IV	**Code Optimization and Code Generation**	Global Data Flow Analysis, A Few Selected Optimizations like Command Sub Expression Removal, Loop Invariant Code Motion, Strength Reduction etc. Issues in the Design of a Code Generator, The Target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs, Next-Use Information, A Simple Code Generator, Register Allocation and Assignment, The DAG Representation of Basic Blocks, Peephole Optimization, Generating Code from DAGs, Dynamic Programming Code-Generation Algorithm, CodeGenerators.	**9**
TOTAL			**36**

Text Books:

1. *Compilers: Principles, Techniques, and Tools,* A.V. Aho, Monica Lam, Ravi Sethi, and J.D. Ullman, 2nd Edition, 2006, Addison Welsley
2. *Engineering a Compiler,* K.D. Cooper, and Linda Torczon, 2nd Edition, 2011, Morgan Kaufmann

Reference Books:

1. K.C. Louden, *Compiler Construction: Principles and Practice,*1st Edition, 1997, Cengage Learning

2. D. Brown, J. Levine, and T. Mason, *LEX and YACC,* 2nd Edition, 2011, O"Reilly Media

Paper IV/Subject Name: Microprocessor		**Subject Code:ECE022C609**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to teachabout the architecture, design aspects of I/O of and Memory Interfacing circuits of 8086 microprocessor and 8051 microcontroller.

Prerequisites: Concepts of Digital Logic and Operating Systems

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basic concepts of microprocessor and microcontroller.	**BT 2**
CO 2	**Apply** the concepts learnt to design and implement programs on 8086 microprocessors, I/O and Memory Interfacing circuits and 8051 microcontroller-based systems.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**8086 Microprocessor**	Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.	**9**
II	**8086 System Bus Architecture**	8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors	**9**
III	**I/O Interfacing**	Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.	**9**
IV	**8051 Microcontroller**	Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming. Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.	**9**
TOTAL			**36**

Text Books:

1. *Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design*, Yu-Cheng Liu, Glenn A.Gibson, 2nd Edition, 2007, Prentice Hall of India,
2. *The 8051 Microcontroller and Embedded Systems: Using Assembly and C*,Mohamed Ali Mazidi, Janice GillispieMazidi, Rolin McKinlay, 2nd Edition, 2011, Pearson Education.

Reference Books:

1. DoughlasV.Hall, *Microprocessors and Interfacing, Programming and Hardware*, 2nd Edition, 2012, TMH

Paper V/ Subject Name: Economics and Accountancy		Subject Code:COM022C601
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to enable the students to understand and interpret the basic financial statements and to make the students learn basics in managing finance and to now pricing mechanism.

Prerequisites: Fundamental Concepts of Basic Mathematics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the impact of economic variables on the business.	**BT 2**
CO 2	**Build** financial statements and balance sheets.	**BT 3**
CO 3	**Analyze** the financial statements of a company.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Introduction to Economics**	Introduction to Engineering Economics, Economic Efficiency. Scope of Engineering Economics, Elements of Cost, Break Even Analysis, Elementary economic analysis, Demand and Supply.Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle.	**9**
II	**Theory of Cost, Production, Price and Distribution**	Theory of Cost and Production: Concepts and types of Costs, Derivation of Cost Function and Profit Maximization, Start -run and Long -run behavior of Production, Analysis and Properties of ISO quant, Meaning and Types of Production Function, Price output determination under different market structure: Perfect competition, Monopoly, Monopolistic competition and oligopoly, Theory of Distribution: Derived demand, Factor price determination: wage, rent, capital, service, profit	**9**
III	**Basics of Accounting & Preparation of Final Accounts**	Introduction, Accounting Mechanics- Double Entry System, Classification, Rules for Debit and Credit Concepts, Indian Accounting Standards, Various concepts like Journal, ledger and preparation of trial balance. Trading account, Profit & Loss account, Adjustments, Balance Sheet, Forms of balance Sheet, Assets and their classification, liabilities and their classification, uses and limitations.	**9**
IV	**Depreciation & Cashbook**	Rules for determining initial expenditure, Deferred Revenue expenditure, initial & Revenue receipts, initial & Revenue Profits, initial & Revenue Loss. Depreciation Policy, Causes of Depreciation, straight line method. Cashbook, Kinds of cashbook, Purchase daybook, Sales daybook, Bills receivable book, Bills payable book.	**9**
TOTAL			**36**

Text Books:

1. *Engineering Economics and Financial Accounting*, R. Kesavan,C.Elanchezhian and T.Sundar Selwyn,2011, Laxmi Publications.
2. *Management Accounting and Financial Control,* Maheswaran. S.N., 4th Edition, 2018, Sultan Chand

Reference Books:

1. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, *Financial Accounting*, 5th Edition, 2013, Vikas Publications
2. D. D. Chaturvedi, S. L. Gupta, *Business Economics – Theory and Applications*, 2013, International Book House Pvt. Ltd.

Paper VI/Subject Name: Data Communication and Networks Lab		Subject Code:CSE022C611
L-T-P-C – 0-0-4-2	Credit Units: 02	Scheme of Evaluation: P

Objective:

The objectives of the course are to make the students learn socket programming and working with simulation tools and also to provide hands on experience on various networking protocols.

Prerequisites: Fundamentals of Computer Programming and Data Communication

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Explain** and **compare** the various protocols.	**BT 2**
CO 2	**Utilize** simulation tools for network programming	**BT 3**
CO 3	**Analyze** the performance of the routing algorithmsand protocolsin different layers.	**BT 4**

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

- To study various topologies for establishing computer networks.
- To learn the usage of various basic tools (crimping, krone etc.) used in establishing a LAN.
- To familiarize with switch, hub, routers & bridges used in networks.
- To learn the usage of connecters and cables (cabling standards) used in networks
- To make certain copper and fiber patch cords using different standards.
- Use commands like ping, ipconfig for trouble shooting network related problems.
- NIC Installation & Configuration (Windows/Linux)
- TCP/UDP Socket Programming
- Develop a program to compute the Hamming Distance between any two code words.
- Develop a program to compute checksum for an _m' bit frame using a generator polynomial.
- IPC (Message queue)
- Implementation of a Prototype Multithreaded Server
    - Implementation of o Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
    - Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
    - Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

Text Books:

1. *Data and Computer Communication*, William Stallings, 10th Edition, 2013, PHI.
2. *Data Communications and Networking*, Behrouz A Forouzan, 4th Edition, 2017, Tata McGraw Hill
3. *Computer Networks*, Tannenbaum, 3rd Edition, 1996, Pearson Education.

Reference Books:

1. L.L. Peterson & B.S. Davie, *Computer Networks: A Systems Approach*, 5thEdition, 2011, Morgan Kaufmann
2. AnuranjanMisra, *Computer Networks*, 2006, Acme Learning, Morgan Kaufman Publication, New Delhi

Paper VII/Subject Name: Microprocessor Lab		**Subject Code:ECE022C619**
L-T-P-C – 0-0-4-2	**Credit Units: 02**	**Scheme of Evaluation: P**

Objective:

The objectives of the course are to make the students learn about Microprocessor 8086 and its features.

Prerequisites: Assembly Language Programming.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the concept of 8086 programming using Microprocessor Kit.	**BT 2**
CO 2	**Construct** small programs on 8086 microprocessor kit.	**BT 3**

Detailed Syllabus:

Minimum 20 Laboratory experiments based on the following-

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Introduction to MASM and TASM. Assembling and executing the programs.	3
2	Programs involving data transfer instructions a) Byte and word data transfer in different addressing mode b) Block move with overlap and without overlap c) Block exchange	3
3	Programs involving arithmetic and logic operation on signed and unsigned multi byte numbers a) 16-bit addition and subtraction b) 32 addition and subtraction c) 16-bit multiplication of signed and unsigned numbers d) 8-bit division of signed and unsigned numbers e) 16-bit division of signed and unsigned numbers	3
4	Code conversions a) Converting BCD into ASCII b) Binary to BCD c) BCD to binary	3
5	Program involving string manipulation a) String reversal b) Comparison of two strings c) Program to search for a character in a string d) Program to check for a palindrome	3
6	Programs involving branch / loop instructions a) Program to find largest and smallest in a series. b) Program to sort the numbers in ascending/ descending order. c) Addition of n numbers	3
	Total	**18**

Text Books:

1. *Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design*, Yu-Cheng Liu, Glenn A.Gibson, 2nd Edition, 2007, Prentice Hall of India,

Reference Books:

1. DoughlasV.Hall, *Microprocessors and Interfacing, Programming and Hardware*, 2nd Edition, 2012, TMH

***** Note: For detailed syllabus for Other School Open Elective-II subjects offered by CSE Department, please check the 'Detailed Syllabus of Other School Open Electives' section below.**

Paper IX/Subject Name: Effective Workplace Communication		**Subject Code:CEN982A601**
L-T-P-C – 1-0-0-1	**Credit Units: 01**	**Scheme of Evaluation: TP**

Objective:

The objectives of the course are to introduce students to areas of concern in the workplace environment like culture, business etiquettes, decision making, and workplace interpersonal relationships

Prerequisites: Basic knowledge of interpersonal communication and organizational communication paradigms.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** business culture, business etiquettes, decision making, and workplace interpersonal relationships.	**BT 2**
CO 2	**Apply** the concepts learnt in real life for professional and corporate communication.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Communicating Across Cultures in a Diverse Work Environment**	What is Culture, Workplace culture, Communicating across different cultures, Culture and writing skills, Culture and non-verbal communication, Managing Global Teams. Cross cultural communication (view of authority – Egalitarian versus Hierarchy and status; view of society – individualist or collectivist society teamwork versus individualism; view of time – linear and flexible punctuality, technology; cultural contexts, international communication, high and low context culture, intercultural communication and the workplace, cultural conflicts, resolving conflicts.	**3**
II	**Business Etiquette**	What is etiquette, Constituents of etiquette (First Impression, Dressing and Grooming etiquette, Conduct at the workplace, Body Language, Introducing yourself and others, Business Cards, Dining and Gifts, Meeting Customers and Clients, Travelling, Gender issues, Small talks etiquette, General business meeting etiquettes, Offline Networking etiquette) Business Etiquette and modern technology (emails, Instant Messaging, Text messages and Mobile Phones, Social Networking sites, , Using Software and Hardware, Audio/Videoconferencing)	**3**
III	**Managing Relationship at Work**	Peer-to-peer relationship, peer-to-superior relationship, peer-to subordinate relationship, Communicating Effectively within your team, Gateways to effective interpersonal communication, conflicts in a team. Theories of Interpersonal and Organizational Communication. Classical Rhetoric, Contagion Theory, Enactment theory, Groupthink, Network theory, Media richness and media naturalness theory, Reduced social cues approach, Sense making, Uncertainty reduction theory.	**3**
IV	**Corporate Communication**	Organizational Decision Making tools – Brainstorming, Nominal Group Technique, Delphi Technique Why corporate communication, Focus areas of Corporate communication (Internal – employees, departments; External – reputation, corporate social responsible, government, financial communication, media, crisis communication)	**3**
TOTAL			**36**

Text Books:

1. *Business Communication: Essential Strategies for Twenty-first Century Managers,* Verma, Shalini, 2nd Edition, Vikas Publishing House Pvt. Ltd, pp. 30-47, 100-116, 140-147, 155-159, 415-443.

Reference Books:

1. Mukherjee, Hory Sankar,*Business Communication: Connecting At Work*, 1st Edition, 2013, Oxford University Press, pp. 530 – 543, 501-528

17. DETAILED SYLLABUS OF 7TH SEMESTER

Paper I/Subject Name: Web Technology		**Subject Code:CSE022C701**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to provide knowledge on the basic web concepts, scripting languages and Internet protocols.

Prerequisites: Concepts of Databases and Object-Oriented Programming

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basic concept of web development	**BT 2**
CO 2	**Apply** the concepts learnt to develop simple web applications	**BT 3**
CO 3	**Assess** and **evaluate** two web applications based on various design factors.	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Introduction, To Web Technology**	World Wide Web: Introduction to TCP/IP and WAP, DNS, Email, TelNet, HTTP and FTP. Introduction to Browser and search engines, Working of the search engines, Miscellaneous Web Browser details, Introduction to Web Servers: Features of web servers, caching, case study-IIS, Apache, Configuring web servers.Internet Principles – Basic Web Concepts – Client/Server model – retrieving data from Internet – HTM and Scripting Languages – Standard Generalized Mark –up languages – Next Generation – Internet –Protocols and Applications.	**9**
II	**HTML,CSS, Java Script**	Web Pages - types and issues, tiers; comparisons of Microsoft and java technologies, WWW-Basic concepts, web client and web server, http protocol (frame format), universal resource locator (URL), HTML different Tags, sections, image & pictures, listings, tables, frame, frameset, form. The need of dynamic web pages; an overview of DHTML, cascading style sheet (CSS), comparative studies of different technologies of dynamic page creation.Java Script : Data types, variables, operators, conditional statements, array object, date object, string object, Dynamic Positioning and front end validation, creating rollovers, building smarter forms, Event Handling, working with cookies, DOM, node and objects, creating sliding menu, pop-up menu, slideshow with caption	**9**
III	**XML and AJAX**	XML – Server side includes – communication – DTD – Vocabularies – DOMmethods – Introduction of XML, Validation of XML documents, DTD, Ways to use XML, XML for data files, HTML Vs XML, Embedding XML into HTML documents, Converting XML to HTML for Display, Rewriting HTML as XML, Firewalls– Proxy Servers.AJAX technologies, Action, XML HttpRequest database operations, security, issues	**9**
IV	**J2SE, J2EE, Servlet and JSP**	Data Types, Arrays, Type Casting, Classes and Objects, Inheritance, Interfaces, Exception Handling, Multithreading,J2EE as a framework, Client Server Traditional model, Comparison amongst 2-tier, 3-tier and N-tier Architectures, Thin and Thick Clients. J2EE Servlet 2.x Specification, Writing small Servlet Programs, Deployment Descriptor, Inter Servlet Collaboration, Session: Definition, State on web, Different ways to track sessions.JSP Technology Introduction-JSP and Servlets- Running JSP Applications Basic JSP- JavaBeans Classes - Support for the Model- View- Controller Paradigm- Case Study- Related Technologies.	**9**
TOTAL			**36**

Text Book:

1. *Internet and World Wide Web How to program*,Deitel H.M. and Deitel P.J, 4th Edition, 2012, Pearson International, New Delhi.
2. *Web Technology,*Gopalan N.P. and Akilandeswari J., 2nd Edition, 2014. Prentice Hall of India.
3. *Java How to Program*, Paul Dietel and Harvey Deitel,8th Edition, 2014, Prentice Hall of India.

Reference Books:

1. Uttam K.Roy, *Web Technologies*, 2011, Oxford University Press.
2. Godbole A. S. &Kahate A., TMH, *Web Technologies*, 2nd Edition, 2006, TMH

Paper II/Subject Name: Artificial Intelligence		**Subject Code:CSE022DC702**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to make the students learn the basic concepts of Artificial Intelligence along with its problem-solving techniques.

Prerequisites: Concepts of Mathematics, Programming Languages, Data Analytic Techniques

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Interpret** and manipulate a given problem in the language/framework of different AI methods.	**BT 2**
CO 2	**Identify** problems that are amenable to solution by AI methods.	**BT 3**
CO 3	**Analyze** and **assess** basic AI algorithms for their applications.	**BT 4 & 5**

Detailed Syllabus

Modules	Topics	Course Contents	Hours
I	**Introduction and Production Systems**	Introduction to AI-Problem formulation, Problem Definition - Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.	**9**
II	**Knowledge Representation and Inference**	Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.	**9**
III	**Planning and Machine Learning**	Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning	**13**
IV	**Expert Systems**	Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.	**5**
TOTAL			**36**

Text Book:

1. *AI: A Modern Approach,* Stuart Russel and Peter Norvig, 2nd Edition, 2007, Pearson Education
2. *Artificial Intelligence,* Kevin Night, Elaine Rich, Nair B., 3rd Edition, 2008, Mc Graw Hill
3. *Introduction to AI and ES*, Dan W. Patterson, 3rd Edition, 2007, Pearson Education.

Reference Books:

1. Peter Jackson, *Introduction to Expert Systems*, 3rd Edition, 2007, Pearson Education
2. Deepak Khemani, *Artificial Intelligence*, 2013, Tata Mc Graw Hill Education.

Paper III/Subject Name: Web Technology Lab		Subject Code:CSE022C711
L-T-P-C – 0-0-4-2	Credit Units: 04	Scheme of Evaluation: P

Objective:

The objectives of the course are to teach the students practically about Internet and Web Page Design by using Markup Languages and XML and also to introduce them to the concept of Server-Side technologies.

Prerequisites: Computer Programming Fundamentals

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Interpret** the concepts of front end and backend programming for web development.	**BT 2**
CO 2	**Apply** the concepts on designing web pages.	**BT 3**
CO 3	**Analyze** and **test**web applications in different web servers	**BT 4 & 5**

Detailed Syllabus:

Minimum 10 Laboratory experiments based on the following-

1. Web page design: Designing web pages with HTML- use of tags, hyperlinks, URLs, tables, text formatting, graphics & multimedia, imagemap, frames and forms in web pages.
2. Use of Cascading Style Sheet in web pages.
3. Creating interactive and dynamic web pages with JavaScript: JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; client-side form validation; using properties and methods of built-in objects.
4. Extensible Markup Language (XML): Introduction- using user-defined tags in web pages; displaying XML contents; XML DTDs; use of XSL.
5. Server-side scripting: overview of CGI, ASP, and JSP.
6. Server side scripting using PHP; PHP basics, HTML form data handling, Web database connectivity-introduction to ODBC; PHP with database connectivity.
7. Exposure to Advanced Web Technologies (as far as possible; not to be made compulsory): Distributed Object based models- DCOM, CORBA, EJB; Web services and Related Technologies- ISAPI, SOAP, UDDI, WSDL; Other Advanced Web Technologies- AJAX, ISAPI, .NET. Web Security.

Text Book:

1. *Web Technologies,* Godbole and Kahate, 3rd Edition, 2017, McGraw Hill Education.

Reference Books:

1. Kogent Learning Solutions Inc., *Web Technologies: HTML, Javascript, PHP, Java, JSP, XML and AJAX, Black Book*, 1st Edition, 2009, Dreamtech Press.
2. Uttam K. Roy, *Web Technologies*, 1st Edition, 2010, Oxford.
3. N. P. Gopalan and J. Akilandeswari, *Web Technology: A Developer's Perspective*, 2nd Edition, 2014, Prentice-Hall of India Pvt. Ltd.

***** Note: For detailed syllabus for the subjects under Elective-I and Elective-II, please check the 'Detailed Syllabus of Electives' section below.**

***** Note: For detailed syllabus for RSET Open Elective-I subjects offered by CSE Department, please check the 'Detailed Syllabus of RSET Open Electives' section below.**

18. DETAILED SYLLABUS OF 8TH SEMESTER

Paper I/Subject Name: Cryptography and Network Security		**Subject Code:CSE022C801**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to explain the basics of cryptography, kinds of security threats in networks and to learn to find the vulnerabilities in programs and to overcome them and to teach about the models and standards for security.

Prerequisites: Concepts of Number Theory and Networking

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**

CO 1	**Understand**and **illustrate** basic cryptographic algorithms, message and web authentication and security issues.	**BT 2**
CO 2	**Demonstrate** the current legal and ethical issues towards information.	**BT 2**
CO 3	**Identify** the applications of different protocol like SSL, TLS etc.	**BT 3**
CO 4	**Analyze** and **assess** the security services and mechanisms	**BT 4**

Detailed Syllabus

Modules	Topics	Course Contents	Hours
I	**Introduction**	Need for Security, Security Approaches, Principles of Security, Types of Attacks, Brute Force Attack, Encryption, Decryption, Crptosystem, Cryptographic Techniques: Substitution Ciphers, Transposition Ciphers, Product Ciphers, Stegenography, Block Cipher, Stream Cipher.	**9**
II	**Symmetric and Asymmetric Key Cryptography**	Overview, Algorithm Modes and Types, Data Encryption Standard: Simplified DES, The Strength of DES, Differential and Linear Cryptanalysis. Triple DES, Blowfish. Confidentiality usingConventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation. Modular Arithmetic, Public Key Cryptography and RSA: Principles of Public Key Cryptosystems, Difference with Symmetric Key Cryptography, The RSA Algorithms, Key Management, Diffie Hellman Key Exchange.	**9**
III	**Authentication Protocols**	Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, MD5 Message Digest Algorithms, Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standards.	**9**
IV	**Security Protocols**	Security Applications and Protocols- Authentication Applications: Secure HTTP, HTTPS, ERT, SSH, Kerberos.Email Security: PGP, S/MIME.IP Security: Overview, IPSec architecture.	**9**
TOTAL			**36**

Text Books:

1. *Cryptography and Network Security*, Atul Kahate, 2nd Edition. 2003, Tata McGraw Hill.
2. *Cryptography and Network security,* Fourozan, 3rd Edition, 2007, McGraw Hill

Reference Books:

1. William Stallings, *Cryptography and Network Security*: *Principles and Practices*", 5th Edition, 2010, Prentice Hall.
2. Michael Howard, David LeBlanc, John Viega, *24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them*, 1st Edition,2009, Mc Graw Hill Osborne Media.

***** Note: For detailed syllabus for the subjects under Elective-III and Elective-IV, please check the 'Detailed Syllabus of Electives' section below**

***** Note: For detailed syllabus for RSET Open Elective-II subjects offered by CSE Department, please check the 'Detailed Syllabus of RSET Open Electives' section below.**

19. DETAILED SYLLABUS OF SUBJECTS UNDER ELECTIVE-I

Paper IV/Subject Name: Mobile Computing		**Subject Code:CSE022D701**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to teach the concept of mobile computing paradigm, its applications and limitations, typical mobile networking Infrastructure through a popular GSM protocol.

Prerequisites: Concepts of Computer Networks

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** mobile technologies in terms of hardware, software, and communications and describe how mobile technology functions to enable other computing technologies.	**BT 2**
CO 2	**Utilize** mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures.	**BT 3**
CO 3	**Analyze** any new technical issues related to new paradigm and come up with a solution(s).	**BT 4**
CO 4	**Evaluate** the effectiveness of different mobile computing frameworks.	**BT 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Introduction**	Mobile Communications, Mobile Computing – Paradigm. Promises/Novel Applications and impediments and Architecture; Mobile and Hand held Devices, LirMatioris of Mobile and Handhold Devices. GSM — Services. System Architecture. Radio Interlaces, Protocols. Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.	**9**
II	**Wireless Medium Access Control (MAC)**	Motivation for a specialized MAC (Hidden and exposed terminals. Near and far terminals), SOMA, FDMA TOMA, COMA, Wireless LAN/(IEEE802.11), Mobile Network Layer IP end Mobile IP Network Layers, PacketDelivery and Handover Management, Location Management, Registration. Tunneling and Encapsulation, Route Optimization, DHCR Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. Database Issues: Database Hoarding & Caching Techniques. Client-Server Computing a Adaptation, Transnational Models, Query processing, Data Recovery Process & QoS Issues	**13**
III	**Data Dissemination and Synchronization**	Communications Asymmetry. Classification of Data Delivery Mechanisms. Data Dissemination, Broadcast Models. Selective Tuning and Indexing Methods. Data Synchronization – Introduction. Software and Protocols.	**9**
IV	**Mobile Ad hoc Networks (MANETs)**	Introduction, Applications a Challenges of a MANET Routing, Classification of Routing Algorithms. Algorithms such as DSR. AODV. DSDV. etc. , Mobile Agents. Service Discovery. Protocols and Platforms for Mobile Computing : WAP, Bluetooth. XML. J2ME. JavaCard. PaImOS, Windows CE. SymbianOS. Unix for Mobile Devices. Android.	**5**
TOTAL			**36**

Text Books:

1. *Mobile Communication*, Joctien Schuller, 2nd Edition, 2009, Addison-Wesley
2. *Mobile Computing*, Raj Kamal, 2nd Edition, 2007,Oxford University Press.

Reference Books:

1. Jochen Sdiiler,*Mobile Communications*, 2nd Edition, 2004,Addison-Wesley.
2. Stomenovlc and Cacute, Handbook of Wireless Networks and Mobile Computing, 2002, Wiley.
3. Reza Behravanfar, *Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML,* 2004, Cambridge University Press.

Paper IV/Subject Name: Natural Language Processing		Subject Code:CSE022D702
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to provide the student with knowledge of various levels of analysis, language modelling involved in NLP.

Prerequisites: Concepts of Automata Theory

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** the fundamental concepts of Natural Language Processing.	**BT 2**
CO 2	**Solve** the NLP tasks using various categories of algorithms.	**BT 3**
CO 3	**Analyze** and **evaluate** the algorithms applied	**BT 4& 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours

I	**Overview and Language Modeling**	Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages-NLP Applications-Information Retrieval. Language Modeling: Introduction-Various Grammar-based Language Models-Statistical Language Model	**9**
II	**Word Level, Syntactic and Semantic Analysis**	Word Level Analysis: Introduction- Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Introduction-Context-free Grammar-ConstituencyParsing-Probabilistic Parsing Semantic Analysis: Introduction- Meaning Representation-Lexical SemanticsAmbiguity-Word Sense Disambiguation. Discourse Processing: Introduction- cohesion-Reference ResolutionDiscourse Coherence and Structure	**9**
III	**Natural Language Generation and Machine Translation**	Natural Language Generation: Introduction-Architecture of NLG SystemsGeneration Tasks and Representations-Application of NLG. Machine Translation: Introduction-Problems in Machine TranslationCharacteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages	**9**
IV	**Information Retrieval and Lexical Resources**	Information Retrieval: Introduction-Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval - Evaluation Lexical Resources: Introduction-WordNet-FrameNet-Stemmers-POS TaggerResearch Corpora	**9**
TOTAL			**36**

Text Books:

1. *Natural Language Processing and Information Retrieval*, Tanveer Siddiqui, U.S. Tiwary, 1st Edition, 2008, Oxford University Press

Reference Books:

1. Daniel Jurafsky and James H Martin, *Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition*, 2ndEdition, 2008, Prentice Hall.
2. James Allen, Bejamin Cummings, *Natural Language Understanding*, 2nd Edition, 1995, Pearson.

Paper IV/Subject Name: VLSI Design		Subject Code:CSE022D703
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to teach the evolution of different integration techniques, fabrication of MOS devices and the analog and digital circuits using MOSFETS

Prerequisites: Basics of Analog and Digital electronics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the fabrication of different MOS devices	**BT 2**
CO 2	**Apply** a combination of hardware and software to address the given problems.	**BT 3**
CO 3	**Analyze** and **assess** abstract problems.	**BT 4& 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours

I	**Introduction and Fabrication Techniques**	Evolution of VLSI, Introduction to Integrated circuits, MOS Transistor, I-V characteristics of nMOS and pMOS transistors, transconductance (gm), channel length modulation.Wafer fabrication, Waferprocessing, Oxidation,Patterning Silicon gate NMOS process CMOS process Nwell,Pwell-Twintub,resistor, capacitor and diode in IC CMOS Process enhancements,Ion beam techniques, Chemical methods	**9**
II	**Analog VLSI**	Introduction to analog VLSI, Analog circuit building blocks Switches,active resistors. Current sources and sinks, Current mirrors/amplifiers, MOS &BJT,inverting amplifiers, CMOS and BJT two stage opamp	**9**
III	**Digital VLSI**	Basic electrical properties of NMOs &CMOSinverters, Stick Diagram & Design rules, Scaling of MOS Circuits, Subsystem Design and Layout, The CMOS structure: NAND and NOR gates, transfer characteristics, System Design and Design Methods;Adder Architectures, Multiplier Architectures, CounterArchitectures, ALU Architectures. Latches, Flip-flops, Registers and Register Files, Moore and Mealy Machines, SRAM Cell, DRAM cells	**9**
IV	**ASIC Design and VHDL**	Architecture and programming technologies of ROMs, EPROMs, Introduction to ASIC, PLA, PAL, Gate arrays, CPLDs and FPGAs, programmable interconnect -Configuration memory. VHDL: Basics of VHDL-Operators, hierarchy procedures and assignment	**9**
TOTAL			**36**

Text Books:

1. *Introduction to VLSI Circuits and Systems,*John .P. Uyemura, 1st Edition, 2001, John Wiley
2. *Basic VLSI Design*, Douglas A Pucknell, Kamran Eshraghian, 3rd Edition, 1995, Prentice Hall Indi

Reference Books:

1. Wayne Wolf, *Modern VLSI Design*, 3rdEdition, 1997, Pearson Education,

20. DETAILED SYLLABUS OF SUBJECTS UNDER ELECTIVE-II

Paper V/Subject Name: Big Data Analytics		**Subject Code:CSE022D704**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are:

- To make the students analyse the components of cloud computing and its business perspective.
- To explain evaluation of the various cloud development tools.
- To explain collaboration with real time cloud services.
- To make the students analyse the case studies to derive the best practice model to apply when developing and deploying cloud-based applications.

Prerequisites: Concepts of Databases and Networks

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** how to leverage the insights from big data analytics and the various NoSql alternative database models.	**BT 2**

CO 2	**Apply** different analytic techniques on real-time streaming data	**BT 3**
CO 3	**Analyze** resultant data using various statistical measures	**BT 4 & 5**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Introduction to Big Data and Hadoop Framework**	Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis Vs Reporting - Modern Data Analytic Tools.Distributed File Systems - Large-Scale FileSystem Organization – HDFS concepts - MapReduce Execution, Algorithms using MapReduce, Matrix-Vector Multiplication – Hadoop YARN	**9**
II	**Data Analysis**	Statistical Methods:Regression modelling, Multivariate Analysis - Classification: SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics – Data analysis using R	**9**
III	**Mining Data Streams**	Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.	**9**
IV	**Big Data Frameworks**	Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations – Hbase Clients – Examples – Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts. Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation – HiveQL Queries	**9**
TOTAL			**36**

Text Books:

1. *Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics,* Bill Franks, 1st Edition, 2012, Wiley and SAS Business Series.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013

Reference Books:

1. Michael Berthold, David J. Hand, *Intelligent Data Analysis,* 2nd Edition, 2007, Springer.
2. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, *Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses*, 1st Edition, 2013, Wiley.
3. P. J. Sadalage and M. Fowler, *NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence*", 1st Edition, 2012, Addison-Wesley Professional.
4. Richard Cotton, *Learning R- A Step-by-step Function Guide to Data Analysis*, 1st Edition, 2013, O'Reilly Media.

Paper V/Subject Name: Introduction to Data Science		**Subject Code:CSE022D705**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to explain the students about the mathematical concepts required for data science and teach data analytics problem solving frameworks.

Prerequisites: Basic concepts of Mathematics, Computer Programming, Data Structures and Databases

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Illustrate** a flow process for data science problems and **classify** data science problems into standard typology	**BT 2**
CO 2	**Construct** R or Python codes for data science solutions	**BT 3**
CO 3	**Examine** results to the solution approach	**BT 4**
CO 4	**Assess** the solution approach and Construct use cases to validate approach and identify modifications required	**BT 5**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Introduction to Data Science , Data Analytics, Big Data ,Areas and Application of Data Sciences, Mathematical foundation of Data Science , descriptive statistics, notion of probability, distributions, mean, variance, covariance, covariance matrix, understanding univariate and multivariate normal distributions, introduction to hypothesis testing, confidence interval for estimates ,Statistical Inference:, Introduction to R and Python : Import –Export functions, DPLYR functions , Data Visualization .	**9**
II	**Algorithms for Data Sciences**	Introduction to machine learning, Linear regression and regularization, Model selection and evaluation, Classification: kNN, decision trees, Classification: SVM, Ensemble methods: random forests, Intro to probability: Naïve Bayes and logistic regression, Clustering: k-means, hierarchical clustering	**9**
III	**Recommendation Systems**	Algorithms for Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis , Case Study	**9**
IV	**Information retrieval and Data Visualization**	Text mining and information retrieval :Mining Social-Network Graphs, Social networks as graphs, Clustering of graphs, Direct discovery of communities in graphs ,Partitioning of graphs, Neighbourhood properties in graphs ,Data Visualization, Basic principles, ideas and tools for data visualization	**9**
Total			**36**

Text Book:

1. *Doing Data Science, Straight Talk From The Frontline*, Cathy O'Neil and Rachel Schutt, 1st Edition, 2014,O'Reilly

Reference Books:

1. James, G., Witten, D., Hastie, T., Tibshirani, R.,*An introduction to statistical learning with applications in R,* 7th Edition, 2014, Springer.
2. Murphy, K, *Machine Learning, A Probabilistic Perspective,* 2012, MIT Press.
3. Mohammed J. Zaki and Wagner Miera Jr., *Data Mining and Analysis: Fundamental Concepts and Algorithms*, 1st Edition, 2014,Cambridge University Press.

Paper V/Subject Name: Optical Fiber Communication		Subject Code:CSE022D706
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to teach the basic elements of optical fiber transmission link, the different kind of losses, signal distortion, fiber optical receivers and noise performance in photo detector and link budget, WDM, SONET/SDH network

Prerequisites: Semiconductor Devices,Laws of reflection and refraction

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Illustrate** optical fiber communication link, structure, propagation and transmission properties of an optical fiber	**BT 2**
CO 2	**Identify** the principles of optical sources and power launching-coupling methods.	**BT 3**
CO 3	**Analyze** the propagation characteristics of an optical signal in different types of fibers	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Introduction**	Basic optical laws and definitions, Principles of lightpropagation in fibers, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Monomode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables. Attenuation, signal distortion in optical fibers, Dispersion intramodal & inter modal, Dispersion shifted and flattened fiber.	**9**
II	**Optical Sources and Detectors**	LED's- Structure, Materials, Characteristics, Modulation,Power & efficiency, Laser Diodes - Basic concept, Hetro Structure, properties and modulation. PIN and Avalanche photo diodes, photo detectornoise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.	**9**
III	**Optical FIber Communication System**	Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Applications, fibre losses,fiber splicing, WDM,SONET/SDH Networks,Optical Amplifiers	**9**
IV	**Optical Fiber Measurements**	Measurements of Fiber attenuation, Dispersion,refractive index profile, Numerical aperture & diameter.Link Budget	**9**
TOTAL			**36**

Text Books:

1. *Optical Fiber Communications: Principles And Practice,* John Senior, 3rd Edition, 2010, Pearson Education
2. *Fiber Optics and Optoelectronics,*Khare, 2004, Oxford University Press
3. *Introduction To Optical Fiber Communications Systems*, William B. Jones, 1995, Oxford University Press

Reference Books:

1. Mybaev,*Fiber Optics Communication Technology,* 1st Edition 2002,Pearson Education.
2. Palais, *Optical Communication,*4th Edition, 1998, Pearson Education
3. Keiser, Gerd, *Optical Fiber Communications*, 5th Edition 2017, McGraw Hill Education
4. Selvarajan, *Optical Fiber Communication: Principles And Systems,*2002, TMH

21. DETAILED SYLLABUS OF SUBJECTS UNDER ELECTIVE-III

Paper III/Subject Name: Digital Image Processing		**Subject Code:CSE022D801**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to provide the students with an overall insight to the process of Digital Image Processing and teach various image enhancement techniques and image representation process.

Prerequisites: Basic Concepts of Programming and Mathematics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Illustrate** the importance of image transforms, different types of image transforms and their properties, image compression, etc.	**BT 2**
CO 2	**Experiment with** the different image enhancement techniques	**BT 3**
CO 3	**Analyze** the different causes for image degradation.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Digital Image fundamentals**	Introduction – Origin – Steps In Digital Image Processing – Components – Elements Of Visual Perception – Image Sensing And Acquisition – Image Sampling And Quantization – Relationships Between Pixels – Color Models.	**9**
II	**Image Enhancement**	Spatial Domain: Gray Level Transformations – Histogram Processing – Basics Of Spatial Filtering–Smoothing And Sharpening Spatial Filtering – Frequency Domain: Introduction To Fourier Transform – Smoothing And Sharpening Frequency Domain Filters – Ideal, Butterworth And Gaussian Filters. Image restoration and segmentation: Noise Models – Mean Filters – Order Statistics – Adaptive Filters – Band Reject Filters – Band Pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener Filtering Segmentation: Detection Of Discontinuities–Edge Linking And Boundary Detection – Region Based Segmentation- Morphological Processing- Erosion And Dilation.	**9**
III	**Wavelets and Image Compression**	Wavelets – Subband Coding – Multiresolution Expansions – Compression: Fundamentals – Image Compression Models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.	**9**
IV	**Image representation and recognition**	Boundary Representation – Chain Code – Polygonal Approximation, Signature, Boundary Segments – Boundary Description – Shape Number – Fourier Descriptor, Moments-Regional Descriptors –Topological Feature, Texture – Patterns And Pattern Classes – Recognition Based On Matching	**9**
TOTAL			**36**

Text Books:

1. *Digital Image Processing*, Rafael C. Gonzales, Richard E. Woods, 3rdEdition, 2010, Pearson Education, 2010.

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, *Digital Image Processing Using MATLAB,*3rdEdition, 2011, Tata Mc Graw Hill Pvt. Ltd.
2. Anil Jain K, *Fundamentals Of Digital Image Processing*,1st Edition, 1988, PHI Learning Pvt. Ltd.
3. Willliam K Pratt, *Digital Image Processing*, 4th Edition, 2002, John Willey
4. Malay K. Pakhira, *Digital Image Processing and Pattern Recognition*, 1stEdition, 2011, PHI Learning Pvt. Ltd.

Paper III/Subject Name: Neural Networks and Fuzzy Logic		Subject Code:CSE022D807
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to teach the concepts of artificial neural networks, the basic theory and algorithm formulation of Fuzzy logic and explain approach to solving real world problems.

Prerequisites: Concepts of Artificial Intelligence and Mathematics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Describe** Fuzzy Logic and Artificial Neural Network techniques in building intelligent machines	**BT 2**
CO 2	**Apply** Artificial Neural Network & Fuzzy Logic models to handle uncertainty and solve engineering problems.	**BT 3**
CO 3	**Analyze**the feasibility of applying a Neuro-Fuzzy model for a particular problem	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Introduction**	Biological neurons and McCulloch and Pitts models of neuron, Types of activation functions, Neural networks architectures, Linearly separable and linearly non-separable systems and their examples, Features and advantages of neural networks over statistical techniques, Knowledge representation, learning process, error-correction learning, concepts of supervised learning, and unsupervised learning, Applications of Neural Networks	**9**
II	**Supervised and Unsupervised Learning Neural Networks**	Single layer perception and multilayer perceptron neural networks, their architecture, Error back propagation algorithm, generalized delta rule, learning factors, step learning, Momentum learning, Concept of training, testing and cross-validation data sets for design and validation of the networks. Competitive earning networks, kohonen self-organizing networks, K-means and LMS algorithms, RBF neural network, its structure and Hybrid training algorithm for RBF neural networks, Comparison of RBF and MLP networks Learning, Vector Quantization neural network architecture and its training algorithm, Hebbian learning, Hopfield networks.	**13**
III	**Fuzzy Logic**	Basic Fuzzy logic theory, sets and their properties, Operations on fuzzy sets, Fuzzy relation and operations on fuzzy relations and extension principle, Fuzzy membership functions and linguistic variables, Fuzzy rules and fuzzy reasoning, Fuzzification and defuzzification and their methods, Fuzzy inference systems, Mamdani Fuzzy models, and Fuzzy knowledge based controllers	**9**
IV	**Applications of Fuzzy Logic and Fuzzy Systems**	Fuzzy pattern recognition, Fuzzy image processing, Simple applications of Fuzzy knowledge based controllers like washing machines, traffic regulations, and lift control	**5**
TOTAL			**36**

Text Books:

1. *Neural Networks, Fuzzy Logic, and Genetic Algorithms,*Rajsekaran and G. A. Vijaylakshmi Pai,1st Edition, 2003, PHI
2. *Neural Network- A Comprehensive Foundation,* Simon Haykin, 2nd Edition, 1998, Pearson Education

Reference Books:

1. Timothy J. Ross, *Fuzzy Logic with Engineering Applications*, 3rd Edition, 2010, Wiley India Publications
2. Laurence Fausett, *Fundamentals of Neural Networks*, 1st Edition, 2004, Pearson Education
3. S. N. Sivanandam, S. Sumathi, and S. N. Deepa, *Introduction to Neural Network Using MATLAB*, 1ST Edition, 2012, Tata McGraw-Hill Publications

Paper III/Subject Name: Embedded Systems		Subject Code:CSE022D803
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to make the students understand and design embedded systems and real-time systems.

Prerequisites: Fundamental Concepts ofDigital Logic, C Programming and Microprocessor

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** and identify the unique characteristics of real-time systems	**BT 2**
CO 2	**Apply** real-time systems design techniques to various software programs.	**BT 3**
CO 3	**Analyze** the unique design problems and challenges of real-time systems	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Hardware Concepts**	Application and characteristics of embedded systems, Overview of Processors and hardware units in an embedded system, General purpose processors, Microcontrollers:8051, Application- Specific Circuits (ASICs), ASIP, FPGA, ARM-based System on a Chip (SoC), Network on Chip (NoC), Levels of hardware modelling, Verilog, Sensors, A/D-D/A converters, Actuators.Interfacing using RS-232,UART, USB, I2C, CAN bus, Flexray, SRAM and DRAM, Flash memory.	**9**
II	**Real Time Operating Systems**	Real-Time Task Scheduling: Some important concepts, Types of real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event-Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA).	**13**
III	**Commercial Real Time Operating Systems**	Time services, Features of a Real-time operating system, Unix-based Real-time operating systems, POSIX-RT, A survey of contemporary Real- time operating systems, Microkernelbased systems, Benchmarking real-time systems.	**9**
IV	**Embedded Application Development**	UML 2.0, State charts, General language characteristics, MISRA C, Hardware/Software Co- design, Hardware/software partitioning, Testing embedded systems, Design for testability and Self-test.	**5**
TOTAL			**36**

Text Books:

1. *Embedded Systems Design – A Unified Hardware /Software Introduction,*Frank Vahid and Tony Givargis, 2001,John Wiley
2. *An Embedded Software Primer,* David E.Simon, 1999, Addison Wesley.

Reference Books:

1. Wayne Wolf, Computers as Components, *Principles of Embedded Computing System Design*, 2000, Harcourt India, Morgan Kaufman Publishers

Paper III/Subject Name: Bioinformatics		Subject Code: CSE022D804
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to impart basic knowledge on various techniques and areas of applications in bioinformatics and to make the students analyse common problem in bioinformatics, alignment techniques, ethical issues, public data sources, and evolutionary modelling.

Prerequisites: Basics of Computer Programming and Databases

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** the selected tools at NCBI and EBI to run simple analyses on genomic sequences.	**BT 2**
CO 2	**Apply** knowledge of bioinformatics in a practical project and develop the ability for critical assessment of scientific research publications in	**BT 3**

CO 3	**Evaluate** the main databases at the NCBI and EBI resources and compare the databases, tools, repositories and be able to use each one to extractspecificinformation	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I.	**Introduction**	Definition, Scope, Aims and Goals, Importance, Data Acquisition, Applications, its Branches, Genomics, Transcriptomics, Proteomics.	**9**
II.	**Biological Databases**	Biological Databases like Genbank, UCSC, ENSEMBL, EMBL, DDBJ, Protein Sequence Databases: Swiss- prot, PDB, Applications and Drawbacks of biological databases, BLAST, PSI- BLAST (steps involved in use and interpretation of results), BLAST vs FASTA, file formats- FASTA, GCG and ClustalW.	**9**
III.	**Sequence Alignment**	Alignment of pairs of sequences; Introduction, Definition of sequence alignment, Methods - Dot matrix sequence comparison, Similarity searches-PAM and BlOSUM matrix, Dayhoff mutation matrix , construction of PAM and BLOSUM matrix. Differences between PAM & BLOSUM Sequence Similarity Searches: Localversus global. Distance metrics. Similarity and homology. **Sequence Alignment–** Need for Sequence Alignment, Sequence Alignment Types, Pairwise Alignment: Local and Global, Needleman Wunsch Algorithm, Smith Waterman Algorithm, Multiple Sequence Alignment and its types, need, applications.	**9**
IV	**Phylogenetic Analysis and Microarray Technique**	Introduction, Elements of Phylogenetic Models, Tree Interpretation through Paralogs and Orthologs, Phylogenetic Data Analysis through tree method. Introduction to Microarray Technique, its Analysis, Identifying Interactions and Applications **Case Study:** Application of Bioinformatics in Drug Discovery, Human Genome Project.	**9**
TOTAL			**36**

Text Books:

1. *Introduction to Bioinformatics,* Arthur K. Lesk, 4th Edition, 2013, Oxford University Press.
2. *Bioinformatics: Sequence and Genome Analysis,* David W. Mount, 2nd Edition, 2004, Cold Spring Harbor Laboratory Press
3. *Bioinformatics: the Machine Learning Approach,* Pierre Baldi and SørenBrunak, 2nd Edition, 2001, MIT Press.

Reference Books:

1. Attwood, P.Smith, *Introduction to Bioinformatics,*1st Edition, 2001, Benjamin Cummings Pvt Ltd.

22. DETAILED SYLLABUS OF SUBJECTS UNDER ELECTIVE-IV

Paper IV/Subject Name: Wireless Computing		**Subject Code:CSE022D805**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to make the students understand the basic concepts of mobile computing, mobile telecommunication system and different mobile platforms and application development

Prerequisites: Concepts of Computer Networks

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the cellular system design and technical challenges	**BT 2**
CO 2	**Examine** the protocols being used at different layers of cellular network.	**BT 3**

CO 3	**Analyse** the various design parameters, link design, smart antenna, beam forming and MIMO systems.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes.	**12**
II	**Mobile Internet Protocol & Transport**	Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP route Optimisation. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of tCP Window-Improvement in TCP Performance.	**12**
III	**Mobile Tele-communication**	Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).	**8**
IV	**Mobile AD-Hoc Networks, Mobile Platforms & Applications**	Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues.	**16**
Total			**48**

Text Book:

1. *Wireless Network and Mobile Computing,*Koushik Sinha, Sasthi C Ghosh, Bhabani P. Sinha, 1st Edition, 2016, CRC Press
2. *Introduction to Wireless and Mobile Technology,*Dharma Prakash Agarval, Qing and An Zeng, 2nd Edition, 2006, Pearson Education

Reference Books:

1. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, *Principles of Mobile Computing,* 2nd Edition, 2002, Springer
2. C.K.Toh, *Ad-hoc Mobile Wireless Networks,* 1st Edition, 2015, Pearson Education

Paper IV/Subject Name: Computer Vision		Subject Code:CSE022D806
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to explain about thefundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification and scene understanding and to teach about the basic methods to develop applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization etc.

Prerequisites: Concepts of Data Structures and Mathematics

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the different aspects of computing with images.	**BT 2**
CO 2	**Apply** deep learning techniques to process 2D and 3D images.	**BT 3**

CO 3	**Analyze**the major technical approaches involved in computer vision.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	Image Formation and Filtering: Cameras and Optics, Light and Color and Image Filtering, Thinking in Frequency. Feature Detection and Matching: Interest points and corners, Local image features, Model fitting, Hough Transform, RANSAC and transformations.	**12**
II	**Multiple Views and Motion**	Stereo intro and Camera Calibration, Epipolar Geometry and Structure from Motion, Stereo Correspondence and Optical Flow	**12**
III	**Recognition**	Large-scale retrieval: Spatial Verification, TF-IDF, Query Expansion, feature encoding, Large-scale category recognition and advanced feature encoding , Detection with sliding windows , Big Data, and Crowdsourcing and Human Computation.	**8**
IV	**Deep Learning**	Neural networks Basics and Convolutional Networks, Object Detectors Emerge in Deep Scene CNNs and Deeper Deep Architectures, Structured Output from Deep Networks, and "Unsupervised" Learning and Colorization.	**16**
Total			**48**

Text Book:

1. *Computer Vision: Algorithms and Application,*Richard Szeliski, 1st Edition, 2010, Springer

Reference Books:

1. Dana H. Ballard and Christopher M. Brown, *Computer Vision*, 1st Edition, 1982, Prentice Hall.
2. Theo Pavlidis, *Algorithms for Graphics and Image Processing*, 1stEdition, 1982, Springer-Verlag Berlin Heidelberg

Paper IV/Subject Name: Expert Systems		Subject Code:CSE022D807
L-T-P-C – 3-0-0-3	Credit Units: 03	Scheme of Evaluation: T

Objective:

The objectives of the course are to provide an understanding of the Expert Systems and the wider field of applications and to make the students apply, build and modify decision models to solve real problems

Prerequisites: Basic Concepts of Artificial Intelligence

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** the role played by expert systems in today's world.	**BT 2**
CO 2	**Apply**, build and modify decision models to solve real problems.	**BT 3**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction**	nature of Expert Systems. Types of applications of Expert Systems; relationship of Expert Systems to Artificial Intelligence and to Knowledge-Based Systems. The nature of expertise. Distinguishing features of Expert Systems. Benefits of using an Expert System. Choosing an application.	**12**
II	**Architecture**	What an expert system is; how it works and how it is built. Basic forms of inference: abduction; deduction; induction. The representation and manipulation of knowledge in a computer. Rule-based logic-based representations, taxonomies, meronomies, frames ,semantic and partitioned nets.	**12**
III	**Expert Systems Components**	Basic components of an expert system. Generation of explanations. Handling of uncertainties. Truth Maintenance Systems. Expert System Architectures. An analysis of some classic expert systems. Limitations of first generation expert systems. Deep expert systems. Co-operating expert systems and the blackboard model.	**8**
IV	**Building Expert Systems**	Building Expert Systems, Methodologies for building expert systems: knowledge acquisition and elicitation, formalisation, representation and evaluation. Knowledge Engineering tools.	**16**
Total			**48**

Text Book:

1. *Rule Based Expert Systems,* M. SasiKumar, S. Ramani, 1st Edition, 1994, Narosa Publishing House.
2. *Introduction to Expert Systems,* Peter Jackson, 1st Edition, 1992, AWP, M.A.

Reference Books:

1. D.W. Patterson, *Introduction to AI & Expert Systems,* 1st Edition, 1992, PHI

Paper IV/Subject Name: Recent Trends in Computer Science		Subject Code:CSE022D802
L-T-P-C-4-0-0-4	Credit Units: 04	Scheme of Evaluation: T

Objective:

The objectives of the course are to introducethe students to the concepts of deep learning and machine learning concerned with the development and application of modern neural networks, various soft computing techniques and to make the students explore the research issues in Augmented Reality and Virtual Reality (AR &VR).

Prerequisites: Basics of networks, artificial intelligence

Course Outcomes

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

SI No	Course Outcome	Blooms Taxonomy Level
CO 1	**Understand** the issues related to IoT, Virtual and Augmented Reality and Soft computing techniques.	**BT 2**
CO 2	**Construct,** train and test neural network models and make these models work on practical problems in deep Learning	**BT 3**

Detailed Syllabus

Modules	Topics	Course content	Periods
I	**Soft Computing Techniques**	What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification. Genetic algorithm, Bio-inspired algorithms: Ant Colony Optimization, Particle Swarm optimization, Artificial Immune System	**12**
II	**Internet of Things (IoT)**	Introduction to IoT, IoT Technologies and Architectures: Devices and Gateways, Local and wide area networking, Data management, Applications of Internet of Things, Opportunities and Challenges in the Internet of Things.	**12**
III	**Machine Learning**	Learning-Supervised and Unsupervised learning, Adaptive Learning, Reinforcement learning, Linear classification, Loss minimization, Stochastic gradient descent, K-Means Algorithm, The perceptron. Learning by gradient descent. Multilayer perceptron and the back propagation algorithm, Deep learning, Auto-encoders, CNNs, RNNs, Introduction to Natural Language Processing.	**12**
IV	**Virtual and Augmented Reality**	Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality. What is Augmented Reality? History of Augmented Reality.Augmented and Mixed Reality, Difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality	**12**
Total			**48**

Text Books:

1. *Computational Intelligence: An Introduction*, Engelbrech, Andries P., 2nd Edition, 2007, Wiley.

Reference Books:

1. Castro, Leonardo N. de , *Artificial Immune system: A new Computational Intelligence Approach*, 2002, Springer-Verlag, Germany.
2. Bishop, C. M., *Neural Networks for Pattern Recognition*, 1995, Oxford University Press.

23. DETAILED SYLLABUS OF OTHER SCHOOL OPEN ELECTIVES TO BE OFFERED BY CSE DEPARTMENT

Paper VIII/Subject Name: Social Media Studies		**Subject Code: CSE022G505**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to explain the basics of social media, its platforms, benefits, practices and uses and community management and campaign by using social media.

Prerequisites: Fundamentals of Internet

Course Outcomes

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

SI No	Course Outcome	Blooms Taxonomy Level
CO 1	**Demonstrate** the idea behind social media, its characteristics, social media growth, content sharing, etc.	BT 2
CO 2	**Identify**how to connect with peoples via social media.	BT 3
CO 3	**Analyse** different types of platforms and its uses, advantage, disadvantage.	BT 4

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction to Social Media**	What is social media, History, characteristics, the growth of social media, key concept of social media and its type, Classifications of social media, social media landscape 2011 by Fred Cavazza, Honeycomb framework of social media.	9
II	**Understanding Social Media**	Benefits of social media for individuals, Benefits of social media for business, Identification of relevant social media, profile creation, expanding the network, monitoring and analysis.	9
III	**Social Media Tools**	What is platform, importance, advantage and disadvantage of the platform, Social media engagement tools, Social media monitoring and analysis tools, professionally listening tools.	9
IV	**Social Media Marketing**	Social media and customer engagement, Social business, Social analytics and metrics measurement, Engagement on social web, Social CRM, Social object, Social graphs.	9
Total			**36**

Text Books:

1. *Social media marketing: The next generation of Bussiness Engagement,* 2010 by Wiley Publishing, Inc.*, Dave Evans with Jake McKee.*
2. *Understanding social media,* 2012, VarinderTaprial&PriyaKanwar.

Reference Books:

1. Antony Mayfield*, What is social media*, 2008
2. Noah Gray, *Social media marketing step by step instructions for advertising your business*, 2nd Edition, 2018,
3. Paul Slack, *Social Rules! For Entrepreneurs and Small Business: A CommonSense Guide to Social Media Marketing,* 2012*, Wheatmark*

4. Shiv Singh and Stephanie Diamond, *Social Media Marketing for Dummies*,2nd Edition, 2012, John Wiley & Sons

Paper VIII/Subject Name: OpenSource Software		**Subject Code: CSE022G606**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to teach the difference between open source software and commercial software and to familiarize the students with Linux operating system and to make the students understand and develop web applications using open source web technologies like Apache, MySql and PHP.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
Sl No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Demonstrate** the difference between open-source software and commercial software.	**BT 2**
CO 2	**Utilize**Linux operating system and manage applications from the said system software	**BT 3**

CO 3	**Inspect** the applications of web technologies Apache, MySql, PHP.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course Contents	Hours
I	**Open Source Basics and Linux**	Introduction to Open Source – Open Source vs. Commercial Software – What is Linux? - Free Software – Where I can use Linux? Linux Kernel – Linux Distributions Introduction to Linux Essential Commands - Filesystem Concept - Standard Files 1. The Linux Security Model - Vi Editor - Partitions creation - Shell Introduction 2. String Processing - Investigating and Managing Processes - Network Clients - Installing Application	**9**
II	**Apache**	Apache Explained - Starting, Stopping, and Restarting Apache - Modifying the Default Configuration - Securing Apache - Set User and Group - Consider Allowing Access to Local Documentation - Don't Allow public html Web sites - Apache control with .htaccess	**9**
III	**MySql**	Introduction to MYSQL - The Show Databases and Table - The USE command - Create Database and Tables - Describe Table - Select, Insert, Update, and Delete statement - Some Administrative detail - Table Joins - Loading and Dumping a Database.	**9**
IV	**PHP**	Introduction- General Syntactic Characteristics - PHP Scripting - Commenting your code - Primitives, Operations and Expressions - PHP Variables - Operations and Expressions Control Statement - Array - Functions - Basic Form Processing - File and Folder Access - Cookies - Sessions - Database Access with PHP - MySQL - MySQL Functions - Inserting Records - Selecting Records - Deleting Records - Update Records	**9**
	TOTAL		**36**

Text Books:

1. *Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP,* James Lee and Brent Ware, 2008, Dorling Kindersley, India Pvt. Ltd.

Reference Books:

1. Eric Rosebrock, Eric Filson,*Setting Up LAMP: Getting Linux, Apache, MySQL, and PHP and working Together*, 2004, John Wiley and Sons.

24. DETAILED SYLLABUS OF RSET OPEN ELECTIVES TO BE OFFERED BY CSE DEPARTMENT

Paper VI/Subject Name:Internet Technology		**Subject Code: CSE022G705**
L-T-P-C – 3-0-0-3	**Credit Units: 03**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to teachclient side and server side programming to design static and dynamic web pages.

Prerequisites: None

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the basic structure of web designing technology	**BT 2**

CO 2	**Apply** the concepts of web technology in designing static and dynamic web pages	**BT 3**
CO 3	**Analyze** and **assess** interactive web pages incorporating validation techniques	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Hours
I	**Introduction**	An overview of Java,Data Types,Variables and Arrays,Operators, Control Statements,Classes,Objects,Methods, Inheritance, Packages, Abstract classes,Interfaces and Inner classes,Exception handling,Introduction to Threads,Multithreading,String handling,Streams and I/O,Applets	**12**
II	**Website Basics**	Web 2.0: Basics-RIA Rich Internet Applications,Collaborations tools, Understanding websites and web servers,Understanding Internet,Difference between websites and web server,Internet technologies ,Overview Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML	**6**
III	**Client Side Scripting**	Java Script: An introduction to JavaScript,JavaScript DOM Model-Date and Objects,Regular Expressions,Exception Handling,Validation,Built-in objects,Event Handling,DHTML with JavaScript. Servlets: Java Servlet Architecture- Servlet Life Cycle,Form GET and POST actions,Session Handling,Understanding Cookies- Installing and Configuring Apache Tomcat Web Server;DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example,JSP: Understanding Java Server Pages,JSP Standard Tag Library(JSTL),Creating HTML forms by embedding JSP code.	**9**
IV	**PHP, AJAX, and Web Services**	An introduction to PHP: PHP Using PHP Variables Program control Built in functions Connecting to Database,Using Cookies,Regular Expressions; XML: Basic XML,Document Type Definition,XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM). AJAX: Ajax Client Server Architecture,XML Http Request Object,Call Back Methods; Web Services: Introduction,Java web services Basics,Creating, Publishing,Testing and Describing a Web services (WSDL),Consuming a web service, Database Driven web service from an application,SOAP.	**9**
Total			**36**

Text Book:

1. *Internet and World Wide Web How to program*,Deitel H.M. and Deitel P.J, 4th Edition, 2012, Pearson International, New Delhi.
2. *Web Technology,*Gopalan N.P. and Akilandeswari J., 2nd Edition, 2014. Prentice Hall of India.
3. *Java How to Program*, Paul Dietel and Harvey Deitel,8th Edition, 2014, Prentice Hall of India.

Reference Books:

1. UttamK.Roy, *Web Technologies*, 2011, Oxford University Press.
2. Godbole A. S. &Kahate A., TMH, *Web Technologies*, 2nd Edition, 2006, TMH

Paper V/Subject Name: Fundamentals of IOT		**Subject Code: CSE022G803**
L-T-P-C –4-0-0-4	**Credit Units: 04**	**Scheme of Evaluation: T**

Objective:

The objectives of the course are to make the understand the vision, application and market perspective of IOT from a global context.

Prerequisites: Concept of Computer Networks, Embedded Systems are required.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	**Understand** the concepts of Internet of Things.	**BT 2**
CO 2	**Utilize** basic IOT applications on embedded platform	**BT 3**

CO 3	**Analyse** the basic challenges to be tackled in IOT and evaluate the performance of the networks.	**BT 4**

Detailed Syllabus:

Modules	Topics	Course content	Periods
I	**Introduction to IOT& M2M**	Defining IOT, Characteristics of IOT, Physical design of IOT, Logical design of IOT, Functional blocks of IOT, Communication models & APIs, Machine to Machine, Difference between IOT and M2M, Software define Network	**12**
II	**Network & Communication aspects**	Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	**12**
III	**Challenges in IOT**	Design challenges, Development challenges, Security challenges, Other challenges, Domain specific applications of IOT, Home automation, Industry applications, Surveillance applications, Other IOT applications	**12**
IV	**Developing IOTs**	Introduction to Python, Introduction to different IOT tools, Developing applications through IOT tools, Developing sensor based application through embedded system platform, Implementing IOT concepts with python	**12**
Total			**48**

Text Books:

1. *Internet of Things (A Hands-on-Approach)*, Madisetti Vijay,Bahga Arshdeep,1st Edition,2014,VPT.
2. *Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*, DaCostaFrancis, 1st Edition, 2013, Apress Publications.

Reference Books:

1. Pfister Cuno,*Getting Started with the Internet of Things*, 1st Edition,2011,O"Reilly Media.