CMR COLLEGE OF ENGINEERING& TECHNOLOGY

(UGC Autonomous)

Kandlakoya, Medchal Road, Hyderabad – 501 401

Institute Vision

- Our Vision is to remain a premier academic institution striving continuously for excellence in technical education, research and render technological services to the nation.

Institute Mission

- Our Mission is to create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with a concern for the society.
- Pursue and Disseminate Research Findings and Offer Knowledge-Based Technological Services to Satisfy the Needs of Society and Industry.
- Promote Professional Ethics, Leadership Qualities and Social Responsibilities.

Department Vision

- To evolve as a centre of academic excellence in Information Technology by building strong teaching and research environment.

Department Mission

- To offer high quality graduate and post graduate programs in computer science education and to prepare students for professional career and/or higher studies globally.
- To develop self learning abilities and professional ethics to serve the society.

Program Education Objectives

- Excel in their professional career and higher education in Information Technology and chosen fields.
- Demonstrate leadership qualities, team work and professional ethics to serve the society
- Adapt to state of art technology through continuous learning in the areas of interest.

Program Outcomes

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **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.
6. **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **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.
11. **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.
12. **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.

Program Specific Outcomes (PSO)

- PSO1: To employ modern computer languages, environment and platforms in creating innovative career paths in the area of information technology.
- PSO2: Effectively integrate IT –based solutions in multidisciplinary areas.

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B. Tech- INFORMATION TECHNOLOGY

CBCS & OUTCOME BASED **I-YEAR** COURSE STRUCTURE & SYLLABUS

(Effective for the students admitted into I year from the Academic Year 2022-23)

SEMESTER - I									
S. No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400001	Matrices and Calculus	BSC	3	1	0	4	40	60
2	A400009	Engineering Chemistry	BSC	3	1	0	4	40	60
3	A405201	Programming for Problem Solving	ESC	3	0	0	3	40	60
4	A402201	Basic Electrical Engineering	ESC	2	0	0	2	40	60
5	A405501	Elements of Computer Science & Engineering	ESC	0	0	2	1	50	-
6	A400502	Engineering Chemistry Laboratory	BSC	0	0	2	1	40	60
7	A402502	Basic Electrical Engineering Laboratory	ESC	0	0	2	1	40	60
8	A403502	Computer Aided Engineering Drawing	ESC	0	1	2	2	40	60
9	A405502	Programming for Problem Solving Laboratory	ESC	0	0	2	1	40	60
10	A400505	Introduction to Social Innovation	HSMC	0	0	2	1	40	60
11	A400703	Constitution of Indian	MC	2	0	0	0	-	-
		Total:		**13**	**3**	**12**	**20**		
		Total hours per Week:		**28**					

SEMESTER - II									
S. No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400101	English for Skill Enhancement	HSMC	2	0	0	2	40	60
2	A400002	Ordinary Differential Equations and Vector Calculus	BSC	3	1	0	4	40	60
3	A400008	Applied Physics	BSC	3	1	0	4	40	60
4	A405301	Data Structures	PCC	3	0	0	3	40	60
5	A400503	English Language and Communication Skills Laboratory	HSMC	0	0	2	1	40	60
6	A400501	Applied Physics Laboratory	BSC	0	0	3	1.5	40	60
7	A405505	Data Structures Laboratory	PCC	0	0	3	1.5	40	60
8	A405504	IT Workshop	ESC	0	0	3	1.5	40	60
9	A400506	Engineering Exploration & Practice	HSMC	0	0	3	1.5	40	60
10	A400704	Universal Human Values	MC	2	0	0	0	-	-
		Total:		**13**	**2**	**14**	**20**		
		Total hours per Week		**29**					
		Total Credits in I Year: 40							

SEMESTER - III									
S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	A400006	Computer Oriented Statistical Methods	BSC	3	1	0	4	40	60
2	A404203	Electronic Devices and Circuits	ESC	2	0	0	2	40	60
3	A404204	Digital Electronics	ESC	3	0	0	3	40	60
4	A412301	Computer Organization and Microprocessor	PCC	3	0	0	3	40	60
5	A412302	Introduction to IOT	PCC	2	0	0	2	40	60
6	A412501	Internet of Things Lab	PCC	0	0	3	1.5	40	60
7	A405506	Python Programming Lab	ESC	0	1	2	2	40	60
8	A404506	Digital Electronics Lab	ESC	0	0	3	1.5	40	60
9	A400507	Social Innovation in Practice	ESC	0	0	2	1	40	60
10	A400701	Environmental Science	MC	2	0	0	0	-	-
		Total:		**15**	**2**	**10**	**20**		
		Total hours per Week:		**27**					

SEMESTER - IV									
S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	A405306	Discrete Mathematics	PCC	3	0	0	3	40	60
2	A412303	Automata Theory and Compiler Design	PCC	3	0	0	3	40	60
3	A405305	Operating Systems	PCC	3	0	0	3	40	60
4	A405304	Database Management Systems	PCC	3	0	0	3	40	60
5	A412304	Java Programming	PCC	2	0	0	2	40	60
6	A412502	Operating Systems Lab	PCC	0	0	2	1	40	60
7	A412503	Database Management Systems Lab	PCC	0	0	2	1	40	60
8	A412504	Java Programming Lab	PCC	0	0	2	1	40	60
9	A405510	Skill Development Course (Data Visualization-R Programing)	PCC	0	0	2	1	40	60
10	A412801	Real-Time Research Project/Field Based Project	PROJ	0	0	4	2	50	-
11	A400702	Gender Sensitization	MC	2	0	0	0	-	-
		Total:		**16**	**0**	**12**	**20**		
		Total hours per Week		**28**					
		Total Credits in II Year: 40							

SEMESTER - V									
S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	PCC	Professional Core Course	PCC	3	1	0	4	40	60
2	PCC	Professional Core Course	PCC	3	0	0	3	40	60
3	PCC	Professional Core Course	PCC	3	0	0	3	40	60
4	PCC	Professional Core Course	PCC	3	0	0	3	40	60
5	PE	Professional Elective - I	PEC	3	0	0	3	40	60
6	PCC	Professional Core Course Lab	PCC	0	0	2	1	40	60
7	PCC	Professional Core Course Lab	PCC	0	0	2	1	40	60
8	PCC	Professional Core Course Lab	PCC	0	0	2	1	40	60
9	HSMC	Advanced English Communication Skills Laboratory	HSMC	0	0	2	1	40	60
10	MC	Intellectual property rights	MC	2	0	0	0	-	-
		Total:		**17**	**1**	**8**	**20**		
		Total hours per Week:		**26**					
	SEMESTER - VI								
S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	PCC	Professional Core Course	PCC	3	0	0	3	40	60
2	PCC	Professional Core Course	PCC	3	0	0	3	40	60
3	PCC	Professional Core Course	PCC	3	0	0	3	40	60
4	PCC	Professional Core Course	PCC	2	0	0	2	40	60
5	PE	Professional Elective-II	PEC	3	0	0	3	40	60
6	PCC	Professional Core Course Lab	PCC	0	0	2	1	40	60
7	PCC	Professional Core Course Lab	PCC	0	0	2	1	40	60
8	PCC	Professional Core Course Lab	PCC	0	0	2	1	40	60
9	PCC	Skill Development course	PCC	0	0	2	1	40	60
10	PROJ	Industrial Oriented Mini Project/ Summer Internship/Skill	PROJ	0	0	4	2	-	100
		Total:		**14**	**0**	**12**	**20**		
		Total hours per Week		**26**					
		Total Credits in III Year: 40							

SEMESTER - VII									
S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	HSMC	Organizational Behavior	HSMC	2	0	0	2	40	60
2	PE	Professional Elective-III	PEC	3	0	0	3	40	60
3	PE	Professional Elective-IV	PEC	3	0	0	3	40	60
4	PE	Professional Elective- V	PEC	3	0	0	3	40	60
5	OE	Open Elective - I	OEC	3	0	0	3	40	60
6	OE	Open Elective - II	OEC	3	0	0	3	40	60
7	PROJ	Major Project Phase-I	PROJ	0	0	6	3	40	60
		Total:		**17**	**0**	**6**	**20**		
		Total hours per Week:		**23**					
	SEMESTER - VIII								
S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	HSMC	Business Economics & Financial Analysis	HSMC	3	0	0	3	40	60
2	PE	Professional Elective- VI	PEC	3	0	0	3	40	60
3	OE	Open Elective-III	OEC	3	0	0	3	40	60
4		Technical Seminar	PROJ	0	0	4	2	-	100
5		Major Project Phase –II	PROJ	0	0	18	9	40	60
		Total:		**9**	**0**	**22**	**20**		
		Total hours per Week		**31**					
	Total Credits in IV Year: 40								

List of Open Electives

Open Elective-I		
Sr.No	**Course Code**	**Course Name**
1	A404601	Fundamentals of Internet Of Things
2	A404602	Principles of Digital Signal Processing
3	A402601	Renewable Energy Sources
4	A402602	Basics of Power Electronics & Drives
5	A405604	Java Programming
6	A405602	Fundamentals of Operating Systems
7	A462601	Fundamentals of Cyber security
8	A467801	Data science using R
9	A466601	Robotics
10	A403601	Fundamentals of Engineering Materials
11	A403602	Basics of Thermodynamics
12	A400601	Basics of Logistics and Supply Chain Management
13	A400602	Industrial Relations
14	A401601	Disaster Preparedness & Planning Management
15	A401602	Environmental Impact Assessment
Open Elective-II		
1	A404603	Sensors and Transducers
2	A404604	Image Processing
3	A402603	Electrical Vehicle Technology
4	A402604	Basics of Power Plant Engineering
5	A405601	Fundamentals of Database management Systems
6	A405605	Web programming
7	A462602	Cloud Computing
8	A467802	Linux Programming
9	A466602	Foundations of Machine Learning
10	A403603	Fundamentals of Manufacturing Processes
11	A403604	Fundamentals of Automobile Engineering
12	A400603	Entrepreneurship
13	A400604	Ethics in Business & Corporate Governance
14	A401603	Remote Sensing & Geographical Information Systems
15	A401604	Solid Waste Management
Open Elective-III		
1	A404605	Fundamentals of Embedded Systems
2	A404606	Data Communications
3	A402605	Nano Technology
4	A402606	EV Batteries & Charging System
5	A405603	Fundamentals of Computer networks
6	A405606	Devops
7	A462603	Cyber Laws & Ethics
8	A467803	Business Intelligence
9	A466602	Artificial Neural Networks
10	A403605	Industrial safety Engineering
11	A403606	Waste to Energy
12	A400605	Basics of Marketing
13	A400606	Intellectual property rights
14	A401605	Energy Efficient Buildings
15	A401606	Environmental Pollution

(A400001) MATRICES AND CALCULUS
(Common to All)

B.Tech. I Year I Semester

L	T	P	C
3	1	0	4

UNIT-I

Matrices: Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous equations and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II

Eigen values and Eigen vectors:

Linear Transformation and Orthogonal transformation: Eigen values, Eigen vectors and their properties, Diagonalization of a square matrix, Cayley-Hamilton theorem (without proof) -Inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformations.

UNIT-III

Calculus:

Mean value theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value theorem, Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates),

Improper Integral: Beta, Gamma functions and their applications.

UNIT-IV

Multivariable calculus (Partial Differentiation and applications):

Partial differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V

Multivariable Calculus (Integration):

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and(Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5thEdition), R.K. Jain and S.R.K Iyengar, Narosa Publications,2016.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, (9th Edition), Erwin kreyszig, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, (10th Edition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
4. Higher Engineering Mathematics, (11thReprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Solve linear system of equations represented by matrices
2. Obtain Eigen values, Eigen vectors and perform diagonalization of a square matrix.
3. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions.
4. Develop the skill of determining optimal values of multivariable functions using classical methods.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3										2
CO5	3	3										2

(A400009) ENGINEERING CHEMISTRY

(Common to all Branches)

B. Tech. I Year I Semester

L	T	P	C
3	1	0	4

UNIT-I: Electrochemistry, Batteries and Corrosion

Electrochemistry: Electrode potential, Standard electrode potential and E.M.F of the cell. Electrochemical cell, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode. Electro chemical series and its applications. **Batteries**- primary (Lithium cell), secondary (Lead acid storage battery and Lithium-ion battery) and Fuel cells (H_2-O_2 and methanol-oxygen), Solar cells - Introduction and applications of Solar cells.

Corrosion: Introduction, Definition, Causes and effects of corrosion, Theories of chemical and electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection, Sacrificial anode and Impressed current cathodic methods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating- Copper plating and electroless plating - Nickel plating.

UNIT-II: Material Chemistry - High Polymers

Types of polymerizations (addition, condensation and copolymerization).

Plastics: Thermoplastic and Thermosetting resins, Compounding and fabrication of plastics (compression and injection moulding). Preparation, properties, Engineering applications of PVC, Teflon and Bakelite.

Fibers: Characteristics of fibers - preparation, properties and uses of Nylon-6,6 and Dacron, Fiber Reinforced Plastics (FRP) - applications.

Rubbers: Natural rubber and its vulcanization. Elastomers: Buna-s, Butyl rubber and Thiokol rubber. **Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Preparation and applications of Polyvinyl acetate, Polylactic acid and poly vinyl alcohol.

UNIT-III: Energy Sources

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages

UNIT-IV: Water Technology

Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness, Estimation of temporary and permanent hardness of water, EDTA method, Numerical problems, Potable water Treatment-Specifications, Steps involved in Treatment-Sedimentation, Coagulation, Filtration, Sterilization, Desalination of Brackish Water, Reverse Osmosis and Electro dialysis.

Industrial water treatment, Boiler Troubles-Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming. Hot lime and cold lime soda Process-Numerical problems, Zeolite process and Ion exchange process. Internal conditioning methods like Phosphate, Carbonate, Calgon and Colloidal conditioning.

UNIT-V: Engineering Materials

Cement: Portland cement, its composition, setting and hardening.

Smart materials: Smart materials and their engineering applications

Advanced Glass Technology: Structure and nature of glasses, transformation range behaviour, dependence of physico-chemical characteristic of glasses on their constituents. Strength of glass and glass articles.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

Text Books:

1. Engineering chemistry (1st edition), B. Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012.
2. Engineering Chemistry (1st edition), P. C. Jain and M. Jain, Dhanapat Rai& Sons.
3. Engineering chemistry (1st edition), Dr. Bharathikumari, Dr. Jyotsna.
4. Engineering chemistry (1st edition), Thirumala chary, E. Laxminyarana, SCITECH Publications (India) Pvt. Ltd.

Reference Books:

1. Engineering Chemistry (2nd edition), Shikha Agarwal; Cambridge University Press, 2015.
2. Engineering Chemistry (2nd edition), Wiley India Pvt. Ltd., Vairam and others, 2014.
3. Engineering Chemistry (1st edition), Prasanth Rath, Cengage Learning, 2015.
4. Applied Chemistry (1st edition), H.D. Gesser, Springer Publishers.
5. Engineering Chemistry (3rd edition), B. Siva Shankar, Tata Mc Graw Hill Publishing Limited, 2015.
6. Text of Engineering Chemistry (12th edition), S. S. Dara, Mukkanti, S. Chand & Co, New Delhi, 2006.

7. Chemistry of Engineering Materials (5th edition), C. V. Agarwal, C. P. Murthy, A. Naidu, Wiley India, 2013.
8. Chemistry of Engineering Materials (3rd edition), R. P. Mani, K. N. Mishra, Cengage Learning, 2015

Course Outcomes:

After completion of the course students will be able to

1. Apply the concept of electrochemistry and corrosion science in various practical applications.
2. Predict the different engineering applications by preparing various polymers.
3. Summarize the manufacturing process of various fuels and their applications in daily life.
4. Understand the benefits of treated water as source in steam generation in industrial application.
5. Illustrate the importance and applications of various advanced engineering materials.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**										**2**
CO2	**3**	**2**										**2**
CO3	**3**	**2**										**2**
CO4	**3**	**2**										**2**
CO5	**3**	**2**										**2**

(A405201) Programming for Problem Solving
(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML, AI&DS, CSE-CS)

B.Tech I Semester

L	T	P	C
3	0	0	3

UNIT-I
Representation of Algorithm: Algorithms for simple task, decision making task like finding maximum numbers of a given set and repetitive task like sum of numbers, Flowchart/Pseudo code with examples, Introduction to C Programming Language: Simple C Programs, Desirable Program Characteristics. C Character Set, Identifiers and Keywords, Data Types, Constants, Variables, Expressions
Operators and Expressions: Unary Operators, Arithmetic Operators, Relational and Logical Operators, Bitwise Operators, Conditional Operator, Assignment Operators, Special Operators, Precedence & Associatively of Operators , Evaluation of Expressions. **Data Input and Output:** Preliminaries, Single Character Input- The get char Function, Single Character Output- The putchar Function, Entering Input Data- The scanf Function, More About the scanf Function, Writing Output Data- The printf Function, More About the printf Function, The gets and puts Functions.

UNIT-II
Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops I/O: Simple input and output with scanf and printf, formatted I/O,
Arrays:one-and two-dimensional arrays, creating, accessing, and manipulating of arrays

UNIT-III
Functions: Defining a Function, accessing a Function, Declaring a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries, Storage classes (auto, extern, static and register). **Recursion:** Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions
Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

UNIT-IV
Structures: Defining structures, initializing structures, unions, Array of structures **Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type **Dynamic memory allocation:** Allocating and freeing memory, Allocating memory for arrays of different data types. **Preprocessor:** Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef

UNIT-V
Files: Text and Binary files, Creating and Reading and writing text and binary files, appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions, Command line arguments.
Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

Textbooks
1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

Reference Books
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. YashavantKanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson

Course Outcomes

Students shall be able

1. Describe the structure of C-program and use iterative and decision control statements for developing solutions to computational problems.
2. Organize data in Arrays, structures and perform operations on data stored in Arrays.
3. Design and develop modular solutions using C-functions and allocate memory dynamically for variables.
4. Create and manipulate C-File structures and use preprocessing directives to control C source code.
5. Compare and contrast various searching and sorting strategies.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**3**	**2**	**3**					**1**	**1**	**2**
CO2	**1**	**3**	**2**		**2**							
CO3	**1**	**2**	**3**	**2**								
CO4	**1**	**1**	**3**		**3**							
CO5		**3**	**2**		**2**						**1**	**1**

(A402201) BASIC ELECTRICAL ENGINEERING
(Common to CSE, INF, ECE)

B.Tech. I Year I Semester

L	T	P	C
2	0	0	2

UNIT-I

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms 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 in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV

Electrical Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

UNIT-V

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, “Basic Electrical Engineering”, S. Chand, 2 nd Edition,
2019.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

Course Outcomes: Upon the completion of the course the student will be able to

1. Understand and analyze basic concepts of DC Circuits
2. Understand and analyze basic concepts of AC Circuits
3. Discus the technical aspects of transformers
4. Study the working principles of Electrical Machines.
5. Introduce components of Low Voltage Electrical Installations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1				2	3	2		1
CO2	3	3		1				2	3	2		1
CO3	3	3		1				2	3	2		1
CO4	3	3		1				2	3	2		1
CO5	3	3		1				2	3	2		1

A405501: ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING

(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML, CSE-CS)

B.Tech. I year I Semester

L	T	P	C
0	0	2	1

UNIT – I

Basics of a Computer – Hardware, Software, Generations of computers. Hardware - functional units,Components of CPU, Memory – hierarchy, types of memory, Input and output devices. Software – systems software, application software, packages, frameworks, IDEs.

UNIT – II

Software development – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, datastructures – definition, types of data structures

UNIT – III

Operating systems: Functions of operating systems, types of operating systems, Device & Resourcemanagement

Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers,cloud services

UNIT – IV

Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensornetworks, vehicular networks, 5G communication.

World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Onlinesocial networks.

Security – information security, cyber security, cyber laws

UNIT – V

Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development,natural language processing, image and video processing.

Cloud Basics

TEXT BOOK:

1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. Gersting University of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

REFERENCE BOOKS:

1 Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.

2 Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.

3 Computer Fundamentals, Anita Goel, Pearson Education India, 2010.

4 Elements of computer science, Cengage.

Course Outcomes:

1. Know the working principles of functional units of a basic Computer
2. Understand program development, the use of data structures and algorithms in problemsolving.
3. Know the need and types of operating system, database systems.
4. Understand the significance of networks, internet, WWW and cyber security.
5. Understand Autonomous systems, the application of artificial intelligence.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**-**	**1**	**-**	**-**	**1**	**-**	**2**	**-**	**-**	**-**	**2**
CO5	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

(A400502) ENGINEERING CHEMISTRY LABORATORY

(Common to all Branches)

L	T	P	C
0	0	2	1

B. Tech. I Year I Semester

Lab Experiments:

1. Estimation of Hardness of water by EDTA Method.
2. Estimation of Alkalinity of Water.
3. Estimation of Copper by Colorimetric Method.
4. Conductometric Titration of a Strong Acid vs a Strong Base.
5. Conductometric Titration of a Weak Acid vs a Strong Base.
6. Potentiometric Titration of a Strong Acid vs a Strong Base.
7. Potentiometric Titration of Ferrous Ammonium Sulphate (FAS) vs Potassium Dichromate.
8. Preparation of Thiokol Rubber.
9. Determination of Viscosity of a Liquid.
10. Determination of Surface Tension of a liquid.
11. Adsorption of acetic acid on Activated charcoal.
12. Estimation of Iodine in Table Salt (by potentiometric)
13. Thin Layer Chromatography (Ortho-Nitro phenol &Para-Nitro phenol).
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

Virtual lab experiments:

1. Construction of Fuel Cell and its working.
2. Smart Materials for biomedical applications.
3. Batteries for Electrical Vehicles.
4. Functioning of Solar Cell and its applications.

Reference Books:

1. Engineering Chemistry Lab Manual (1st edition), Glaze Publishers 2018.
2. Engineering chemistry (1st edition), B. Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry (1st edition), Sashi Chawla, Dhanapath Rai& Sons.

Course Outcomes:

At the end of the course the student will be able to

1. Determine the extent of hardness present in water and its consequences in industrial operations
2. Prepare polymer like Thiokol Rubber
3. Estimate the strength of solutions, p^H of various solutions
4. Determine the viscosity and surface tension of various liquids
5. Apply the electrochemical concepts in conductometric and potentiometric titrations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											1
CO2	3											1
CO3	3											1
CO4	3											1
CO5	3											1

(A402502) BASIC ELECTRICAL ENGINEERING LABORATORY

(Common to CSE, INF, ECE)

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

List of experiments/demonstrations:
PART- A (compulsory)

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series Circuits.
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

PART-B (any two experiments from the given list)

1. Verification of Superposition theorem.
2. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Magnetization Characteristics of DC Shunt Generator.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand,2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1stEdition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Course Outcomes: After completion of the course student will be able to

1. Verify the basic Electrical circuits through different experiments.
2. Analyze the transient responses of R, L and C circuits for different input conditions.
3. Calculate the of Impedance and Current of RL, RC and RLC series Circuits.
4. Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
5. Measure the Active and Reactive Power in a single phase transformer

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3		1				2	3	2	2	1
CO2	3	3		1				2	3	2	2	1
CO3	3	3		1				2	3	2	2	1
CO4	3	3		1				2	3	2	2	1
CO5	3	3		1				2	3	2	2	1

(A403502) COMPUTER AIDED ENGINEERING DRAWING

B.Tech. I Year I Sem.

L	T	P	C
0	1	2	2

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Drawing and their Significance, Introduction to Computer aided drafting – views, commands.

Computer aided drafting of conic Sections: Ellipse, Parabola and Hyperbola – General Method (eccentricity) only.

Computer aided drafting of Cycloid, Epicycloids and Hypocycloid.

UNIT- II

Orthographic Projections: Introduction to Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.

Computer aided orthographic projections – points, lines and planes

UNIT – III

Projections of Regular Solids: Introduction to Regular Solids – Prism, Cylinder, Pyramid, Cone

Computer aided projections of solids – Regular views

UNIT – IV

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric

Projection of objects having non- isometric lines, Isometric Projection of Spherical Parts using computer aided drafting.

UNIT – V

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Conversion of orthographic projection into isometric view and vice versa using computer aided drafting.

TEXT BOOKS:

1. Engineering Drawing, 51st Edition, N.D. Bhatt, Charotar Pub, 2012
2. Computer Aided Engineering Drawing, 2nd Edition, K. Balaveera Reddy et al, CBS Publishers, 2015

REFERENCE BOOKS:

1. Engineering Drawing, 2nd Edition, Basant Agrawal and C M Agrawal, McGraw Hill, 2014
2. Engineering Drawing, 1st Edition, M. B. Shah, B.C. Rane, Pearson, 2015
3. Engineering Drawing, 1st Edition, N. S. Parthasarathy and Vela Murali, Oxford, 2015
4. Engineering Drawing and graphics Using AutoCAD, 3rd Edition, T. Jeyapoovan, Vikas, S.Chand and Company Ltd, 2000

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

1. Apply computer aided drafting tools to create 2D objects like Conic section and Cycloidal curves
2. Sketch the Orthographic projection of Point, Line and Plane objects by drafting tools
3. Create, read and interpret engineering drawings of Solids by computer tools
4. Create and interpret 2D and 3D Isometric objects by drafting tools
5. Conversion of orthographic projection into isometric view and vice versa by using computer aided drafting tools

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	-	3	-	-	2	3	3	1	2
CO2	3	1	3	-	3	-	-	2	3	3	1	2
CO3	3	1	3	-	3	-	-	2	3	3	1	2
CO4	3	1	3	-	3	-	-	2	3	3	1	2
CO5	3	1	3	-	3	-	-	2	3	3	1	2

(A405502) PROGRAMMING FOR PROBLEM SOLVING LAB

(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML,AI&DS,CSE-CS)

B.Tech I Semester

L	T	P	C
0	0	3	1.5

[Note: The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code:Blocks: http://www.codeblocks.org/
DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Objectives

Students will learn the following:

- work with an IDE to create, edit, compile, run and debug programs
- analyze the various steps in program development.
- develop programs to solve basic problems by understanding basic concepts in C like
- operators, control statements etc.
- develop modular, reusable, and readable C Programs using the concepts like functions, arrays etc.
- Write programs using the Dynamic Memory Allocation concept.
- create, read from, and write to text and binary files.

I.OPERATORS AND EVALUATION OF EXPRESSIONS

Demonstration

1.Write a C program to print greetings message on the screen.
2.Write a C program to illustrate usage of comments in C.
3.Write a simple program that prints the results of all the operators available in C (Including pre/post increment, bitwise and/or/not. etc.). Read required operand values from standard input.
4.Write a C program that converts given data type to another using auto conversion and casting. Take the values from standard input.
5.Write a program for finding the max and min from the three numbers (using ternary operator).

Experiment

6.Write a C program to compute simple, compound interest.
7.Write a C Program that declares Class awarded for a given percentage of marks, where mark = 70% = Distinction. (Read percentage from standard input.)

8.Write a C Program that prints a multiplication table for a given number and the number of rows in the table. (For example, for a number 5 and rows = 3, the output should be: 5 x 1 = 5, 5 x 2 = 10, 5 x 3 = 15….
9.Write a program that shows the binary equivalent of a given positive number between 0 to 255.
10. Write a program that asks the user to enter the total time elapsed, in seconds, since an event and converts the time to hours, minutes and seconds. The time should be displayed as hours: minutes: seconds. [Hint: Use the remainder operator]

II. Expression Evaluation

Demonstration

1. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
2. Write a program that asks the user to enter the highest rainfall ever in one season for a country, and the rainfall in the current year for that country, obtains the values from the user, checks if the current rainfall exceed the highest rainfall and prints an appropriate message on the screen. If the current rainfall is higher, it assigns that value as the highest rainfall ever. Use only the single-selection form of the if statement.
3. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).
4. Write a program that finds if a given number is a prime number
5. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
6.Write a program that reads the radius of a circle (as a float value) and computes and prints the diameter, the circumference and the area. Use the value 3.14159 for π.

7.Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

Experiment

8. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
9. Write a C program to find the roots of a Quadratic equation.

III.Iterative statements

Demonstration

1. Input an integer (5 digits or fewer) containing only 0s and 1s (i.e., a "binary" integer) and print its decimal equivalent. [Hint: Use the remainder and division operators to pick off the "binary" number's digits one at a time from right to left. Just as in the decimal number system, in which the rightmost digit has a positional value of 1, and the next digit left has a positional value of 10, then 100, then 1000, and so on, in the binary number system the rightmost digit has a positional value of 1, the next digit left has a positional value of 2, then 4, then 8, and so on. Thus the decimal number 234 can be interpreted as 4 * 1 + 3 * 10 + 2 * 100. The decimal equivalent of binary 1101 is 1 * 1 + 0 * 2 + 1 * 4 + 1 * 8 or 1 + 0 + 4 + 8 or 13.]
2. Armstrong numbers are numbers that are equal to the sum of their digits raised to power of the number of digits in them. The number 153, for example, equals 13 + 53 + 33. Thus, it is an Armstrong number. Write a program to display all three-digit Armstrong numbers.
3. Write a program that reads an integer (5 digits or fewer) and determines and prints how many digits in the integer are 9s.
4. Write a program that keeps printing the powers of the integer 3, namely 3, 9, 27, 91, 273, and so on. Your loop should not terminate (i.e., you should create an infinite loop). What happens when you run this program?
5. Write a C program to calculate the following, where x is a fractional value. $1-x/2+x^2/4-x^3/6$ ……
6. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

7. Write a C program to construct a pyramid of numbers as follows:

```
1                    1
1  2                 2  2
1  2  3              3  3  3
1  2  3  4           4  4  4  4
1  2  3  4  5        5  5  5  5  5
```

Experiment

8. Write a program that reads three nonzero integer values and determines and prints whether they could represent the sides of a triangle.
9. Write a program that reads three nonzero integers and determines and prints whether they could be the sides of a right triangle
10. Write a program that reads a nonnegative integer and computes and prints its factorial
11. Write a program that estimates the value of the mathematical constant ***e*** by using theformula:

$$e^1 = 1 + \frac{1}{1!} + \frac{1^2}{2!} + \frac{1^3}{3!} + \cdots$$

12. Write a program that computes the value of e^x by using the formula

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots, -\infty < x < \infty$$

IV. Arrays, Pointers, and Functions

Demonstration

1.Write a C program to find the minimum, maximum and average in an array of integers.
2.Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension array.
3. Write a C program that uses functions to perform the following:
i. Addition of Two Matrices ii. Multiplication of Two Matrices iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be the same.
4.Write C programs that use both recursive and non-recursive functions
5. To find the factorial of a given integer.

Experiment

6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to compute x^n
8. Write a program for reading elements using a pointer into an array and display the values using the array.
9. Write a program for display values reverse order from an array using a pointer.
10. Write a program through a pointer variable to sum of n elements from an array.

V. Files

Demonstration

1. Write a C program to display the contents of a file to standard output device.
2. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
3. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

Experiment

4. Write a C program that does the following:
It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function)Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)The program should then read all 10 values and print them back
5. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

VI. Strings

Demonstration

1. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
2. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent c.
3. Write a C program that uses functions to perform the following operations:
    - To insert a sub-string into a given main string from a given position.
    - To delete n Characters from a given position in a given string.

Experiment

4.Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
5.Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
6.Write a C program to count the lines, words and characters in a given text.

VII. Sorting and Searching:

1.Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.
2.Write a C program that uses non recursive function to search for a Key value in a givensorted list of integers using binary search method.
3.Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Experiment

4.Write a C program that sorts the given array of integers using selection sort in descending order
5. Write a C program that sorts the given array of integers using insertion sort in ascending order
6.Write a C program that sorts a given array of names

Project

Students must submit a report on one of the following micro-projects before commencement of second internal examination.
1.Library management system
2.Payrol management system
3.Telecom billing management system
4.Bank management system
5.Employee's management system
6.Library management system
7.Personal Diary management system
8.Medical store management system.
9.Phone Contacts management
10.Fee Collection system

TEXTBOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Course Outcomes

Students shall be able to:

CO1: formulate the algorithms for simple problems and translate given algorithms to a working and correct program
CO2: correct syntax errors as reported by the compilers identify and correct logical errors encountered during execution.
CO3: represent and manipulate data with arrays, strings and structures and use pointers of different types
CO4: create, read and write to and from simple text and binary files
CO5: Develop reusable code with the help C-functions

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**2**	**1**							
CO2			**3**	**3**	**1**						**2**	**2**
CO3	**3**	**3**		**2**								
CO4			**3**		**2**						**2**	
CO5	**2**	**2**	**3**								**1**	**1**

****END****

(A400505) INTRODUCTION TO SOCIAL INNOVATION
(Common to all branches)

B.Tech I Year I Semester

L	T	P	C
0	0	2	1

WEEK-1

Types and features of community- Rural, Suburban, Urban and Regional

WEEK-2

Service based learning, Aims of Community based projects, Sustainable Development Goals

WEEK-3

Community visit, Report Writing, Resource Diagram, Chapati Diagram, Transect Walk

WEEK-4

The non-profit sector, public sector, the private sector, the informal sector

WEEK-5

Poster presentation on four sectors

WEEK-6

Process of Design Thinking

WEEK-7

Social organizations and enterprises, social movements

WEEK-8

Social softwares and open-source methods

WEEK-9

Introduction to Ethics, moral values, significance of professional ethics

code of conduct for engineers

WEEK-10

Identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas

WEEK-11

Case studies on Engineering Ethics

WEEK-12

Documentation, Steps for Patent filing and Startups, Poster presentation

Text Books

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors; Georgia Levenson Keohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.

4. Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author)
5. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier
6. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch, Jr., Amber R. Stiles, Robert Fesnak; Springer
7. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.
8. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press-New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012.

Course Outcomes:

On Completion of the course, the students will be able to

1. Identify community issues through community Interaction
2. Illustrate the factors affecting social innovation in various sectors
3. Apply design thinking concept to analyze the community problems
4. Adopt the ethical values in implementing the Social innovation
5. Describe the process of property rights and patent filing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						**1**	**2**		**3**	**2**		
CO2						**2**	**2**		**3**	**3**		
CO3				**2**		**2**	**3**		**2**	**3**		
CO4						**2**	**3**	**3**	**2**	**2**		
CO5		**2**		**2**		**2**	**3**		**2**	**3**		

(A400703) CONSTITUTION OF INDIA
(Common to all branches)

B.Tech. I Year I Semester

L	T	P	C
2	0	0	0

UNIT - 1

History of Making of the Indian Constitution- History of Drafting Committee.

UNIT - 2

Philosophy of the Indian Constitution- Preamble Salient Features

UNIT - 3

Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT - 4

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT - 5

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

REFERENCE BOOKS

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. B. R. Ambedkar framing of Indian Constitution, Dr. S. N. Busi, 1st Edition, 2015.
3. Indian Constitution Law (7thEdn), M. P. Jain, Lexis Nexis, 2014.
4. Introduction to the Constitution of India, D.D. Basu, Lexis Nexis, 2015.

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

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru.
4. Discuss the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
5. Discuss the passage of the Hindu Code Bill of 1956.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**											
CO2												**2**
CO3						**2**						
CO4				**2**		**3**						
CO5		**2**										

(A400101)ENGLISH FOR SKILL ENHANCEMENT
(Common to all branches)

B.Tech. I Year II Semester

L	T	P	C
2	0	0	2

UNIT - I

Chapter entitled 'Toasted English' by R.K.Narayan from "English: Language, Contextand Culture" published by Orient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes -Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives -Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT – II

Chapter entitled 'Appro JRD ' by Sudha Murthy from " English Language , Context and Culture" published by Orient Black Swan ,Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning

UNIT – III

Chapter entitled 'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.
Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled 'Art and Literature' by Abdul Kalam from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Standard Abbreviations in English Grammar: Redundancies and Clichés in Oraland Written Communication.

Reading: Writing: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice Writing Practices
Essay Writing-Writing Introduction and Conclusion -Précis Writing

UNIT - V

Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Writing: Reading Comprehension-Exercises for Practice Technical Reports- Introduction.

NOTE:

Listening and Speaking Skills which are given under in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

- NOTE 1: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open-ended, besides following the prescribed textbook, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- NOTE 2: Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40percent of each topic from the syllabus in blended mode.

TEXT BOOK:

1. "English: Language, Context and Culture" by Orient Black Swan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing, (2nd edition) by Liss and Davis (OUP)2014.
2. Richards, Jack C. Interchange Series. Introduction, ,(4th edition), Cambridge University Press 2022
3. Remedial English Grammar by Wood F.T, Macmillan.2007.
4. Learn English: A Fun Book of Functional Language, Grammar and Vocabulary, (2nd edition) Chaudhuri, Santanu Sinha,. Sage Publications India Pvt. Ltd.2018
5. Technical Communication,(1st edition), Wiley India Pvt. Ltd.2019
6. English for Technical Communication for Engineering, Vishwamohan, Aysha 2013

Course Outcomes:

On completion of the course students will be able to

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known passages.
5. Acquire basic proficiency in reading and writing modules of English and take an active part in drafting paragraphs, letters, essays, abstracts, precis, and reports in various contexts.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	-	-	-	-	-	-	-	-	2	2	
CO3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-		3	-	2
CO5	-	-								2		3

(A400002)ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All)

B.Tech. I Year II Semester

L	T	P	C
3	1	0	4

UNIT-I
First Order ODE

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's differential equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II
Ordinary Differential Equations of Higher Order

Second and higher order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin ax, cosax, polynomials in x, $(x)$and $xV(x)$, method of variation of parameters.

UNIT-III
Laplace transforms

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem and Second shifting theorem. Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't'. Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV
Vector Differentiation

Vector point functions and scalar point functions, Gradient, Tangent plane and normal line, Directional derivatives, Divergence and Curl, Solenoidal and Irrotational vectors, Scalar potential functions, Vector Identities.

UNIT-V
Vector Integration

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stoke's (without proofs) and their applications.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5thEdition),R.K.Jain and S.R.K.Iyengar, Narosa Publications,2016.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, (9th Edition),Erwinkreyszig, John Wiley& Sons,2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, (10thEdition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
4. Higher Engineering Mathematics, (9thEdition), H.K.Dass and Er.Rajnish Verma, S Chand and company Limited, New Delhi, 2011.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Determine first order differential equations and obtain solutions.
2. Solve the Higher order differential equations and apply the differential equation concepts to real world problems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Evaluate Gradient – Divergence – Curl, Directional derivatives.

5. Evaluate the line, surface and volume integrals and converting them from one to another.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**										**2**
CO2	**3**	**3**										**2**
CO3	**3**	**3**										**2**
CO4	**3**	**3**										**2**
CO5	**3**	**3**										**2**

(A400008) APPLIED PHYSICS
(Common to all branches)

B.Tech I-Year II Semester

L	T	P	C
3	1	0	4

UNIT – I

QUANTUM MECHANICS:
Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect – de Broglie hypothesis- Davisson and Germer experiment – Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

ELECTRIC PROPERTIES OF SOLIDS:
Free electron theory (Drude& Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT – II

SEMICONDUCTORS AND DEVICES:
Intrinsic and extrinsic semiconductors, Variation of Fermi level with temperature – Hall Effect - Construction, principle of operation and characteristics of P-N Junction diode, Zener diode

PHOTONIC DEVICES
Direct and indirect band gap semiconductors –LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT – III

LASERS
Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser , CO_2 laser - semiconductor laser-applications of laser.

FIBER OPTICS:
Introductionto optical fiber - advantages of optical fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

UNIT - IV

DIELECTRIC MATERIALS
Dielectric Materials: Basic definitions- types of polarizations (qualitative) –Local field – ClasiusMossoti Equation ferroelectric, piezoelectric, and pyroelectric materials – applications

MAGNETIC MATERIALS:
Introduction to magnetic materials - Hysteresis-soft and hard magnetic materials- magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics.

UNIT - V

ENERGY MATERIALS:
Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

NANOTECHNOLOGY

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapour deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

TEXT BOOKS

1. Engineering Physics(3rd edition), PK Palanisamy, SciTech Publications, 2015.
2. Essentials of Nan science &Nanotechnology(1st Edition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021.

REFERENCES

1. Fundamentals of Physics.(6th edition), Halliday, R.Resnick and J.Walker, John Wiley and Sons, 2001.
2. Quantum Physics,(2nd edition), H.C. Verma, TBS Publication, 2012
3. Introduction to Solid State Physics, (7th edition), Charles Kittel, Wiley Eastern, 2019.
4. Physics of Semiconductor devices (4th edition), Simon.MSze and Kwok K . Ng, Wiley Student Edition,2006.

COURSE OUTCOMES

On completion of the course students will be able to

1. Understand the concepts of Quantum mechanics and visualize the differences between the solids by their classification.
2. Identify and analyze the importance of semiconductors and semiconductor devices in Science and Engineering Applications.
3. Appreciate the features and applications of Lasers and Optical fibers.
4. Applying the fundamental properties of dielectric and magnetic materials in different engineering fields.
5. Evaluate various aspects of Energy Materials and Nano-materials and their applications in diverse fields.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

(A405301) DATA STRUCTURES
(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML,CSE-CS)

B.Tech II Semester

L	T	P	C
3	0	0	3

UNIT-I
Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, concepts of circular linked link list, double linked list, Stacks- Operations, array and linked representations of stacks, stack applications- infix to postfix conversion, postfix evaluation, Queues- operations, array, and linked representations.

UNIT-II
Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-III
Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, concepts of Red – Black, Splay Trees.

UNIT-IV
Graphs: Graph Implementation Methods. Graph Traversal Methods. Sorting: Quick Sort, Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT-V
Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries

TEXTBOOKS
1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/PearsonEducation.

REFERENCE BOOK
1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilbergand, B.A.Forouzan, Cengage Learning.

Course Outcomes
Students shall be able
CO1: Design and Implement Linear Data structures
CO2: Explain the need of Dictionary data structure and implement dictionary data structure using Hash tables and skip lists.
CO3: Design and Implement various forms of tree data structures
CO4: Explain, analyze, and implement various graph traversal, sorting techniques.
CO5: Describe various pattern matching algorithms.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1								1
CO2	3	3	1	1								1
CO3	3	3	1	1								1
CO4	3	3	1	1								1
CO5	3	3	1	1								1

(A400503) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY
(Common to all branches)

L	T	P	C
0	0	2	1

B.Tech I-Year II Semester

The English Language and Communication Skills (ELCS) Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening Skills Objectives

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions. Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
   - Listening for general content
   - Listening to fill up information
   - Intensive listening
   - Listening for specific information

Speaking Skills Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional
   - Oral practice
   - Describing objects/situations/people
   - Role play – Individual/Group activities
   - Just A Minute (JAM) Sessions

   The following course content is prescribed for the English Language and Communication Skills Lab

Exercise – I

CALL Lab: Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs - Past Tense Marker and Plural Marker- Testing Exercises

ICS Lab: Understand: Spoken vs. Written language- Formal and Informal English. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab: Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation. Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises.

ICS Lab: Understand: Features of Good Conversation – Strategies for Effective Communication. Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise – III

CALL Lab: Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI). Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises

ICS Lab: Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV

CALL Lab: Understand: Listening for General Details. Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab: Understand: Public Speaking – Exposure to Structured Talks - Non-verbal CommunicationPresentation Skills. Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V

CALL Lab: Understand: Listening for Specific Details. Practice: Listening Comprehension Tests -Testing Exercises

ICS Lab: Understand: Group Discussion Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:** The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems, with one Master Console, LAN facility and English language learning software for self- study by students. System Requirement (Hardware component): Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications: i) Computers with Suitable Configuration ii) High Fidelity Headphones
2. **Interactive Communication Skills (ICS) Lab :** The Interactive Communication Skills Lab: A Spacious room with movable chairs and audiovisual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc. Source of Material (Master Copy): • Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus

REFERENCE BOOKS:

1. English Language Communication Skills Lab Manual cum Workbook,(1st edition) ,by Rajesh Kumar Cengage Learning India Pvt. Ltd,2022
2. Communicative English - A workbook, (Revised Edition)byShobha, KN &Rayen, J. Lourdes, Cambridge University Press, 2019.
3. Communication Skills: A Workbook. Kumar, (2nd edition) by Sanjay &Lata, Pushp, Oxford University Press, 2019.
4. ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities,(Board of Editors), Orient Black Swan Pvt. Ltd, 2016
5. English Language Skills: A Practical Approach, Mishra, Veerendra et al., Cambridge University Press, 2020.

Course Outcomes:

On completion of the course students will be able to

1. Understand the nuances of English language through audio- visual experience and group activities.
2. Neutralise their accent for intelligibility.
3. Speak with clarity and confidence which in turn enhances their employability skills
4. Students will learn public speaking skills and overcome stage fear.
5. Express clarity of thoughts, capability to hold the discussion with everyone and develop analytical thinking.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-		2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	2	-	2

(A400501)APPLIED PHYSICS LABORATORY

B.Tech I-Year II Semester

L	T	P	C
0	0	3	1.5

(Any 8 experiments are to be performed)

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. a) V-I and L-I characteristics of light emitting diode (LED)b)V-I Characteristics of solar cell
6. Determination of Energy gap of a semiconductor.
7. Determination of the resistivity of semiconductor by two probe method.
8. Study of B-H curve of a magnetic material.
9. Determination of dielectric constant of a given material
10. a) Determination of the beam divergence of the given LASER beam)Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11. Understanding the method of least squares – torsional pendulum as an example.
12. Diffraction grating: Determination of wavelength of a source (LASER).

LABORATORY MANUAL:

1. Applied Lab (2nd Edition) Dr M Chandra Shekhar Reddy, Dr Neelima Patnaik, Jaya Prakash Reddy Kasu, Skytech Publications, 2022.
2. "A Text book of Practical Physics"(2nd Edition) - S. Balasubramanian, M.N. Srinivasan S Chand Publishers, 2017.

COURSE OUTCOMES

On completion of the course students will be able to

1. Appreciate quantum physics in optoelectronics.
2. Determine the Planck's constant using Photo electric effect
3. Determine energy gap of a semiconductor diode and magnetic fields.
4. Identify the material whether it is n-type or p-type by Hall experiment.
5. Evaluate the basic properties of lasers and optical fibers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	-	-	-	-	-	-	1
CO2	3	3	1	1	-	-	-	-	-	-	-	1
CO3	3	3	1	1	-	-	-	-	-	-	-	1
CO4	3	3	1	1	-	-	-	-	-	-	-	1
CO5	3	3	1	1	-	-	-	-	-	-	-	1

(A405503) DATA STRUCTURES LAB

(Common to CSE, IT, CSE-DS, CSE-AI&ML, AI&ML, AI&DS, CSE-CS)

B. Tech II Semester

L	T	P	C
0	0	3	1.5

List of Experiments

Week 1: Practice lab to perform the following:

1. **Write a C program to implement the following operations on to a 1D Array:**
   a. **INSERT**
   b. **DELETE**
   c. **SEARCH**
   d. **TRAVERSE**
2. **Write a C program to implement Self-referential Structure.**
3. **Write a C program to Perform Dynamic Memory Allocation.**

Week 2: Linked List

Demonstration

1. Write a C program to implement Single linked list i) Insertion ii)Deletion iii)Display
2. Write a function to reverse the nodes of a Single linked list

Experimentation

1. Write a program that uses functions to perform the following operations on doubly linked list:

   i) Creation ii) Insertion iii) Deletion iv) Traversal

2. Write a program that uses functions to perform the following operations on circular linked list:

   i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 3 : **Stacks, Queues.**

Demonstration

1. Write a program that implement Stack (its operations) using Arrays
2. Write a program that implement Circular Queue (its operations) using Arrays

Experimentation

1. Write C programs to implement Stack ADT using Linked List
2. Write C programs to implement Circular Queue ADT using Linked List

Week 4 : **Applications of Stacks, Dictionaries and Hashing**

Demonstration

1. **Write a C program to Convert the given Infix Expression to Postfix Expression.**
2. Write a C program to implement different hash methods
3. Write a C program to implement the following collision resolving i) Quadratic probing. ii) Linear Probing

Week 5: Applications of Stacks. & Dictionaries and Hashing

Experimentation

1. **Write a C program to Evaluate the given Postfix Expression.**
2. **Implement** Dictionary ADT using list data structure.
3. Implement Dictionary ADT using skip list data structure.

Week 6: Search Trees

Demonstration

1.Write a C program to implement Binary search tree

i) Insertion ii) deletion iii) Traversals

2.Write a C program to implement binary search tree Non - recursively traversals

i) Pre- Order ii) Post –Order iii) In-Order

Week 7: Search Trees

Experimentation

1. (A) Write a C Program to Check if a Given Binary Tree is an AVL Tree or Not

(B) Write a C program to find height of a Binary tree

2. Write a C program to count the number of leaf nodes in a tree.
3. Write a C program to implement AVL tree

i) Creation ii) Deletion iii) Traversals

Week 8: Graphs

Demonstration

1. Write a C program for implementing Graph traversal

i) DFS

Experimentation
1. Write a C program for implementing Graph traversal
i) BFS
Week 9: Sorting
Demonstration
1. Write C programs for implementing the following Sorting methods and display the important steps.
i) Quick Sort ii) Heap sort
Week 10: Sorting
Experimentation
3. Write C programs for implementing the following Sorting methods and display the important steps.
i) Merge sort ii) External Merge sort.
Week 11: Pattern Matching Algorithms
Demonstration
1. Write a C program for implementing pattern matching algorithms
i) Knuth-Morris-Pratt ii) Brute Force
Week 12: Pattern Matching Algorithms
Experimentation
1.Write a C program for implementing pattern matching algorithms
i. Boyer –Moore

TEXTBOOKS:
1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:
1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.
Course Outcomes
Students shall be able.
CO1: Design and Implement Linked List Data structure.
CO2: Design and Implement Linear Data structures.
CO3. Implement Sorting and Tree traversal techniques.
CO4: Design and Implement Non-Linear Data structures.
CO5: Implement KMP and Boyre-Moore pattern matching algorithms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1							
CO2			3	3	1						2	2
CO3	3	3		2								
CO4			3		2						2	
CO5	2	2	3								1	1

(A405504) IT WORKSHOP

(Common to CSE, ECE, IT, CSE-DS, CSE-AI&ML,AI&ML, CSE-CS)

	L	T	P	C
B.Tech I Year II Semester	**0**	**0**	**3**	**1.5**

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the blockdiagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructorsshould verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors,Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA - Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Powerpoint

Task 1: Students will be working on basic power point utilities and tools which help them create basicpowerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text,Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notesetc), and Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS:

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinsonand Ken Quamme. –
CISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan– CISCO Press, Pearson Education.

Course Outcomes

Students shall be able to:

CO-1. Identify various hardware components of a system and their significances
CO-2. Assemble and disassemble the computer.
CO-3. Use various Microsoft tools for text processing, visual presentations, and number crunching
CO-4. Retrieve the information from Internet using web browsers.
CO-5. Safeguard the system from external and internal threats.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**			**2**			**1**					**1**
CO2	**3**			**2**	**2**	**1**						**1**
CO3					**3**					**2**		**2**
CO4		**2**		**2**	**3**	**1**		**1**		**2**		**2**
CO5					**3**	**3**	**2**	**2**				**3**

(A400506) ENGINEERING EXPLORATION & PRACTICE
(Common to all branches)

B.Tech. I Year II Semester

L	T	P	C
0	0	3	1.5

Week-1
Difference between Science and Engineering, Scientist and Engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer. Significance of teamwork, Importance of communication in engineering profession

Week-2
Engineering Design Process, Need statement to Problem conversion, Pair wise comparison chart, decision matrix, Concepts of reverse engineering

Week-3
Project management tools: Checklist, Timeline, Gantt chart, Requirement Analysis

Week-4
Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism

Week-5
3-D Modelling of a Box with two holes and curvature

Week-6
3-D Modelling of Electronic Enclosure and Assembly of two parts

Week-7
Introduction to various platform-based development, Introduction to basic components, transducers, actuators and sensors, Introduction to Tinkercad

Week-8
Introduction to Arduino, basics of programming

Week-9
Interfacing Arduino with actuators and transducers

Week-10
Interfacing Arduino with Sensors, Liquid Crystal Display (LCD)

Week-11
Assembly and Crafting the Prototype

Week-12
Test and Validate the Prototype, Documentation, Panel Presentation

Text Books

1. Engineering Fundamentals: An Introduction to Engineering (Mind Tap Course List) 5th Edition by Saeed Moaveni
2. Software Project Management (SIE), (Fifth Edition); Bob Hughes, Mike Cotterell, Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011) ; ISBN 10: 0071072748 ISBN 13: 9780071072748
3. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt) Ltd., New Delhi.
4. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media
5. Introduction to autocad®2017-2D and 3D design by Bernd S. Palm and Alf Yarwood, Routledge (Taylor and Francis group)
6. Concepts in Engineering Design – 2016; by Sumesh Krishnan (Author), Dr. Mukul Shukla (Author), Publisher : Notion Press.

Course Outcomes

On Completion of the course, the students will be able to

1. Explain the importance of engineering profession in the world.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. Build a mechanism for a given application
4. Create basic 3D models and animations
5. Design a mechatronic system using Arduino and electronic components

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1					3	3	2		3	
CO2		3	1	3	2				3		3	
CO3	3		2		3				3		3	
CO4	2	3	2		3				3	2	3	
CO5			2	1	2		3		3		3	

(A400704) UNIVERSAL HUMAN VALUES
(Common to all branches)

L	T	P	C
2	0	0	0

B.Tech I Year II Semester

UNIT - I

Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT - II

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) • Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT – III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence • Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals • Visualizing a universal harmonious order in society- Undivided Society, Universal Orderfrom family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc., Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT - IV

Understanding Harmony in the Nature and Existence – Whole existence as Coexistence

- Understanding the harmony in the Nature

- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics:
  a. Ability to utilize the professional competence for augmenting universal human order
  b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
  c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019.

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"

Course Outcomes:

On completion of the course students will be able to

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. •
3. They would have better critical ability about various issues in life.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						**2**						
CO2			**2**									
CO3									**2**			
CO4								**2**				
CO5												**2**

(A400006) COMPUTER ORIENTED STATISTICAL METHODS
(Common to CSE, CSC, IT and CSD)

	L	T	P	C
B.Tech II Year I Semester	**3**	**1**	**0**	**4**

UNIT-I
Probability:

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Baye's Rule.

Random Variables : Concept of a Random Variable, Discrete and Continuous random Variable.

UNIT-II
Expectation and Discrete Distributions:

Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem.

Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT-III
Continuous Distributions and Sampling Distributions:

Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.

Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions: Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F-Distribution.

UNIT-IV
Sample Estimation & Tests of Hypotheses:

Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimating the mean, standard error of a point estimate, prediction interval. Two sample: Estimating the difference between two means, Single sample: Estimating a proportion, Two samples: Estimating the difference between two proportions, Two samples: Estimating the ratio of two variances.

Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning single mean, Two samples: tests on two means, One sample: test on single proportion.Two samples: tests on two proportions, Two- sample tests concerning variances.

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UNIT-V

Stochastic Processes and Markov Chains:

Introduction to Stochastic processes: Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXT BOOKS:

1. Probability & StatisticsFor Engineers & Scientists, (9th Edition), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Pearson Publishers, 2011.
2. Fundamentals of Mathematical statistics, S C Gupta and V K Kapoor, Khanna publications.

REFERENCE BOOKS:

1. Fundamentals of Probability and Statistics For Engineers, T.T. Soong, John Wiley & Sons, Ltd, 2004.
2. Probability and statistics for Engineers and scientists, (5th Edition), Sheldon M Ross, Academic press, 2014.
3. Probability and Statistics for Engineers, (8th Edition), Miller and Freund's, Pearson Educations, 2015.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Apply the concepts of probability and Random variables to case studies.
2. Formulate and solve problems involving random variables and discrete distributions.
3. Apply sampling techniques for analyzing experimental data.
4. Apply concept of estimation and testing of hypothesis to case studies.
5. Analyze the data using Stochastic process and Markov chains.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2									
CO2	3	2	2	1								
CO3	3	2	2	2								
CO4	3	2	2	1								
CO5	3	2	2									

(A404203) ELECTRONIC DEVICES AND CIRCUITS
(CSE, CSE (CS), CSE(DS), CSE(AIML), AIML, IT)

B.Tech II Year I Semester

L	T	P	C
2	0	0	2

UNIT-I

Diodes: Diode-Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch-switching times.

UNIT-II

Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT-III

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

UNIT-IV

Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

UNIT–V

Special Purpose Devices: Zener Diode-Characteristics, Zenerdiode as Voltage Regulator, Principle of Operation-SCR, Tunneldiode, UJT, Varactor Diode, Photodiode, Solar cell, LED, Schottky diode.

TEXTBOOKS:

1. Jacob Mill man-Electronic Devices and Circuits, McGraw Hill Education
2. RobertL. Boylestead, Louis Nashelsky-Electronic Devices and Circuits theory, 11thEdition, 2009, Pearson.

REFERENCEBOOKS:

1. Horowitz-Electronic Devices and Circuits, David A. Bell–5thEdition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly-BasicElectronics-PrinciplesandApplications,Cambridge, 2018.

Course Outcomes

Upon successful completion of the course, students will be able to:

1. Understand PN junction diode characteristics under various conditions.
2. Design different diode applications such as rectifiers, clippers& clampers.
3. Analyze the Bipolar Junction Transistor and its characteristics.
4. Understand the Field Effect Transistor characteristics and its applications
5. Acquiretheknowledgeabouttheroleofspecialpurposedevicesandtheirapplications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									2
CO2	3	3	2									2
CO3	3	3	2									2
CO4	3	3	2									2
CO5	3	3	2									2

(A404204) DIGITAL ELECTRONICS
(CSE, CSE(CS), CSE(DS), CSE(AIML), AIML, IT)

B.Tech II Year I Semester

L	T	P	C
3	0	0	3

UNIT-I

BOOLEANALGEBRAANDLOGICGATES: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic.

Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

UNIT-II

GATE – LEVEL MINIMIZATION: The map method, Four-variable map, Five-Variable map, product of sums simplification Don't-care conditions, NAND and NOR implementation other Two-level implementations, Exclusive –Or function.

UNIT-III

COMBINATIONAL LOGIC: Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

UNIT-IV

SEQUENTIAL LOGIC: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure**.** Registers, shift Registers, Ripple counters, synchronous counters, other counters.

UNIT-V

MEMORIES AND ASYNCHRONOUS SEQUENTIAL LOGIC: Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array Programmable Array logic, Sequential Programmable Devices.

Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free State Assignment Hazards, Design Example.

TEXTBOOKS:

1. Digital Design–Third Edition, M.Morris Mano, Pearson Education/PHI.
2. DigitalPrinciplesandApplicationsAlbertPaulMalvinoDonaldP.LeachTATAMcGrawHillEdition.
3. Fundamentals of Logic Design, Roth, 5thEdition,Thomson.

REFERENCEBOOKS:

1. Switching and Finite Automata Theory by Zvi.Kohavi, Tata Mc Graw Hill.
2. Switching and Logic Design, C.V.S.Rao, Pearson Education
3. Digital Principles and Design– Donald D.Givone, Tata Mc Graw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman John Wiley.

Course Outcomes

At the end of the course the student will be able to

1. Analyse various Boolean theorems and apply to Boolean functions.
2. Apply Boolean algebra and K-Maps to minimize Boolean functions.
3. Design various combinational circuits.
4. Design different Sequential circuits.
5. Design digital systems using different PLDs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**									**2**
CO2	**3**	**3**	**2**									**2**
CO3	**3**	**3**	**2**									**2**
CO4	**3**	**3**	**2**									**2**
CO5	**3**	**3**	**2**									**2**

(A412301) COMPUTER ORGANIZATION AND MICROPROCESSOR

B.Tech. II Year I Semester	L	T	P	C
	3	0	0	3

UNIT-I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.

UNIT-II

Central Processing Unit: The 8086 Processor Architecture, Register organization, Physical memory organization, General Bus Operation, I/O Addressing Capability, Special Processor Activities, Minimum and Maximum mode system and timings.

UNIT-III

Assembly Language Programming with 8086- Machine level programs, Machine coding the programs, Programming with an assembler, Assembly Language example programs. Stack structure of 8086, Interrupts and Interrupt service routines, Interrupt cycle of 8086, Interrupt programming, Passing parameters to procedures, Macros, Timings and Delays.

UNIT-IV

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating - point Arithmetic operations. Input-Output Organization: Peripheral Devices, Input- Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP), Intel 8089 IOP.

UNIT-V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

TEXT BOOKS:

3. Computer System Architecture, M. Morris Mano, Third Edition, Pearson. (UNITS – I, IV, V)
4. Advanced Microprocessors and Peripherals, K M Bhurchandi, A. K Ray ,3rd edition, McGraw Hill India Education Private Ltd. (UNITS - II, III).

REFERENCE BOOKS:

1. Microprocessors and Interfacing, D V Hall, SSSP Rao, 3rd edition, McGraw Hill India Education Private Ltd.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002
3. Computer Organization and Architecture, William Stallings, 9th Edition, Pearson.
4. David A. Patterson, John L. Hennessy: Computer Organization and Design – The Hardware / Software Interface ARM Edition, 4th Edition, Elsevier, 2009.

Course Outcomes:

1. Able to understand the basic components and the design of CPU, ALU and Control Unit.
2. Ability to understand memory hierarchy and its impact on computer cost/performance.
3. Ability to understand the advantage of instruction level parallelism and pipelining for high performance Processor design.
4. Ability to understand the instruction set, instruction formats and addressing modes of 8086.
5. Ability to write assembly language programs to solve problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**		**2**									**1**
CO2	**2**	**1**	**2**									**1**
CO3	**2**		**1**									**1**
CO4	**2**											**1**
CO5		**2**	**3**	**1**								**1**

(A412302) INTRODUCTION TO IOT

L	T	P	C
2	0	0	2

B.Tech. II Year I Semester

UNIT-I

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT-II

Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT-III

Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi, Case studies.

UNIT-IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT-V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

Case Study: Agriculture, Healthcare, Activity Monitoring

Text Books:

1. Pethuru Raj and Anupama C. Raman "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press)
2. Terokarvinen, kemo, karvinen and villey valtokari, “Make sensors”: 1st edition, maker media, 2014.

Reference Books:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

Course Outcomes:

Upon completing this course, the student will be able to:

1. Known basic protocols in sensor networks.
2. Program and configure Arduino boards for various designs.
3. Python programming and interfacing for Raspberry Pi.
4. Understand the implementation of IoT with Cloud environment.

5. Explore IoT applications in different domains.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**											**1**
CO2	**1**	**3**	**2**		**1**							**1**
CO3		**2**	**3**		**1**							**1**
CO4	**1**	**2**	**3**		**1**							**1**
CO5			**2**	**1**	**1**						**1**	**1**

(A412501) INTERNET OF THINGS LAB

B.Tech. II Year I Semester

L	T	P	C
0	0	3	1.5

List of Experiments

1. Using raspberry pi
    a. Calculate the distance using a distance sensor.
    b. Basic LED functionality.
2. Using Arduino
    a. Calculate the distance using a distance sensor.
    b. Basic LED functionality.
    c. Calculate temperature using a temperature sensor.
3. Using Node MCU
    a. Calculate the distance using a distance sensor.
    b. Basic LED functionality.
    c. Calculate temperature using a temperature sensor.
4. Installing OS on Raspberry Pi
    a) Installation using PiImager
    b) Installation using image file
        - Downloading an Image
        - Writing the image to an SD card
            - using Linux
            - using Windows
        - Booting up Follow the instructions given in the URL https://www.raspberrypi.com/documentation/computers/getting-started.html
5. Accessing GPIO pins using Python
    a) Installing GPIO Zero library.
        - First, update your repositories list:
        - sudo apt update
        - Then install the package for Python 3:
        - sudo apt install python3-gpiozero

    b) Blinking an LED connected to one of the GPIO pin

    c) Adjusting the brightness of an LED Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.
6. Collecting Sensor Data
    a) DHT Sensor interface
        - Connect the terminals of DHT GPIO pins of Raspberry Pi.
        - Import the DHT library using import Adafruit_DHT
        - Read sensor data and display it on screen.

Textbooks

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Reference Books

1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer, 2016
2. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014

Course Outcomes:

1. Understand the functionality of Raspberry pi and Arduino with various sensor.
2. Program and configure Arduino boards for calculating the temperature and distance by MCU.
3. Understand the PiImager usage in windows and other operating system.
4. Understand the Accessing GPIO pins using Python platform.
5. Explore DHT Sensor interface to collect the data through Raspberry pi.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2			1							1
CO2		2			1							1
CO3	1	2	1		1							1
CO4	1	2	3	1	1							1
CO5	1		2		1							1

(A405506) PYTHON PROGRAMMING LAB

B.Tech. II Year I Sem.

L	T	P	C
0	1	2	2

Week 1.
(Python Language Fundamentals-Installation -Identifiers, Reserved Words, Data Types, Type Casting, Immutability)

Demonstration
Experiment-1: Install Anaconda open-source framework for python.
Experiment-2: Write a program to display 'Hello World'.

Experimentation
Experiment-3: Explore various IDEs for python program development.
Experiment-4: The volume of a sphere with radius r is $4/3\ \pi r^3$. Write a Python program to find the volume of a sphere with radius 5?

Week 2.
(Arithmetic Operators, Relational Operators, Logical operators, Bitwise operators, Assignment operators, Special operators)

Demonstration
Experiment-1; Write a python program to find minimum and maximum of given three numbers.
Experiment-2: Suppose the cover price of a book is $24.95, but bookstores get a 40% discount. Shipping costs $3 for the first copy and 75 cents for each additional copy. Write a python program to compute the total wholesale cost for 60 copies?.

Experimentation
Experiment-3: Write a Python Program to Find the Square Root of a number with out using sqrt function.
Experiment-4: Python Program to Convert Celsius To Fahrenheit.
Experiment-5: Python program to find the maximum of two numbers using ternary operator

Week 3.
(Mathematical Functions, Input and Output statements, Command Line Arguments, String Functions)
Demonstration
Experiment-1: Write a Python program to find area of circle.
Experiment-2: Write a program to read Employee data from the keyboard and print that data.

Experimentation
Experiment-3: Write a program to read 3 float numbers from the keyboard with comma separator and print their sum.
Experiment-4: Write a Program to display Command Line Arguments.

Week 4.
(Flow Control Statements-Conditional Statements, Transfer Statements, Iterative Statements)
Demonstration
Experiment-1. Write a Python program to take a single digit number from the key board and print is value in English word?.

Experiment-2. Write a Python Program to check whether an n-digit integer is an Armstrong number or not.

Experimentation
Experiment-3. Write a Python program to display *'s in pyramid style(also known as equivalent triangle).
Experiment-4. Write a Python Program to Display the multiplication Table.

Week 5.
(Functions-Built in functions, user defined functions, Parameters, return statement, returning multiple values from function, type of arguments, Types of variables-global, local. Recursive functions, Lambda functions, filter function, reduce function, Function aliasing, Function decorators, Generators)

Demonstration
Experiment-1: Write a python function to find factorial of given number?
Experiment-2: Write a program to create a lambda function to find square of given number?

Experimentation
Experiment-3: Lambda Function to find biggest of given values.
Experiment-4: Program to filter only even numbers from the list by using filter() function?

Week 6.
(Working with Strings-Defining String, Multi-line Strings, Accessing characters of a string, Mathematical operators for strings, Membership operator, Comparison of Strings, Removing spaces from the string, Finding Substring, String replacement, Splitting of Strings, Changing cases of a string, Formatting the strings)

Demonstration
Experiment-1: Write a program to accept some string from the keyboard and display its characters by index wise (both positive and negative index).
Experiment-2: Write a program to access each character of string in forward and backward direction by using while loop?

Experimentation
Experiment-3: Program to display all positions of substring in a given main string.
Experiment-4: Write a program to reverse the given String.

Week 7.
(Python Data Structures-List: Creating a list- Accessing elements of a List, Traversing the List, List Manipulation, Ordering the elements of a List, Mathematical Operators for List objects, Membership Operator, Nested Lists, List Comprehensions)
Demonstration
Experiment-1: Write a Python program to display unique vowels present in the given word.
Experiment-2: Write a Python program to Count the Occurrence of an Item in a List.
Experimentation
Experiment-3: Write a Python program to segregate even and odd numbers from the given list of numbers.
Experimnet-4: Write a Python program to find the cumulative sum of elements of the list.

Week 8.
(Python Data Structures-Tuple: Creating a Tuple, Accessing the elements of a tuple, mathematical operators for tuple,

Tuple packing and Unpacking)

Demonstration
Experiment-1: Python program for adding a Tuple to List and Vice-Versa.
Experiment-2: Write a Python program to perform the summation of all elements of each tuple from the list of tuples.

Experimentation
Experiment-3: Write a Python program to multiply adjacent elements of a tuple.
Experiment-4: Write a Python program to find the maximum element in the tuple list.

Week 9.
(Python Data Structures-Set: Creating a Set object, functions of set, Mathematical operations on set, Membership Operators, Set Comprehension, Python Data Structures-Dictionary: Creating a Dictionary Object, accessing data from the dictionary, updating dictionaries, Deleting from dictionary, Functions on dictionary, dictionary comprehension)

Demonstration
Experiment-1. Write a Python program to perform set operations.
Experiment-2: Write a program to print different vowels present in the given word?
Experiment-3: Write a Python program to generate powers of 2 using set comprehensions.
Experiment-4: Write a program to eliminate duplicates present in the list using set
Experiment-5: Write a Python program to enter name and percentage marks in a dictionary and display information on the console.

Experimentation
Experiment-6: Write a program to take dictionary from the keyboard and print the sum of values?
Experiment-7: Write a program to find number of occurrences of each letter present in the given string using dictionary.
Experiment-8: Write a program to accept student name and marks from the keyboard and creates a dictionary. Also display student marks by taking student name as input?

Week 10.
(Python Modules-Creating Modules, Accessing members, module aliasing, member aliasing, reloading a module,
The special variable: __name___. Working with Math, random modules, Python Packages.Python-File Handling-Types of Files, Opening a file, closing a file, properties of File object, writing data to text file, Reading character data from text files, seek (), tell() functions.)

Demonstration
Experiment-1: Create a module **fibo.py** containing Fibonacci(**n**) function(s) and import fibo module in a python script to print Fibonacci series upto **n**.
Experiment-2: Write a python program to print all the contents of a given module.
Experiment-3: Write a python program to create a package containing two or modules.
Experiment-4: Write a python program to import module from a package created in Experiment-3.

Experimentation
Experiment-5: Write a program to check whether the given file exists or not. If it is available then print its content?
Experiment-6: Write a python Program to print the number of lines, words and characters present in the given file?

Experiment-7: Program to read image file and write to a new image file?
Experiment-8: Write a python program to read and write to a CSV file.

Note:
Experiments under Demonstration section are to be demonstrated by the concerned faculty and the experiments under Experimentation section must be performed by the students individually.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and WebApplications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W. Chun, Pearson
6. Introduction to Python, Kenneth A. Lambert, Cengage

Course Outcomes: After completion of the course, the student should be able to

1. Develop the application specific codes using python.
2. Understand Strings, Lists, Tuples and Dictionaries in Python
3. Verify programs using modular approach, file I/O, Python standard library
4. Implement Digital Systems using Python
5. Verify that a file

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**3**	**2**	**2**							**1**
CO2	**2**	**2**	**3**	**1**	**3**							**1**
CO3	**3**	**2**	**2**	**1**	**3**							**1**
CO4	**1**	**3**	**2**	**2**	**3**							**1**
CO5		**2**	**1**	**1**	**3**							**1**

(A404506) DIGITAL ELECTRONICS LABORATORY

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	1.5

Note: Minimum of 12 experiments to be conducted from the following.
List of Experiments:

1. RealizationofLogiccircuittogenerater'sComplementusingLogicGates.
2. Realization of given Boolean function using universal gates and minimizing the same. Compare the gate count before and after minimization.
3. Design and realize Full Adder circuit using gates/universal gates. Implement Full Subtractor using full adder.
4. Realize 4-bit Magnitude Comparator.
5. Realize2:1MUXusing the given gates and Design8:1using2:1MUX.
6. Implement the given Boolean function using the given MUX (ex:code converters).
7. Realizea2x4Decoderusinglogicgatesand implement 3x8Decoder using2x4Decoder.
8. Implement the given Boolean function using given Decoders.
9. Convert Demultiplexer to Decoder
10. Verification of truth tables of flip flops using different clocks (level triggering, positive and negative edge triggering) also converts the given flip flop from one type to another.
11. Designing of Universal n-bit shift register using flip flops and Multiplexers. Draw the timing diagram of the Shift Register.
12. Design a Synchronous binary counter using D-flip flop/given flip flop.
13. Design Asynchronous counter for the given sequence using given flip flops.
14. Designing of MOD8 Counter using JK flip flops.

Major Equipment required for Laboratories:

1. 5V Fixed Regulated Power Supply/0-5VormoreRegulatedPowerSupply.
2. 20MHz Oscillo scope with Dual Channel.
3. Bread board and components / Trainer Kit.
4. Multimeter.

Course Outcomes
Upon completing this course, the student will be able to

1. Acquire the knowledge on numerical information in different forms and Boolean Algebra Theorems.
2. Define Postulates of Boolean algebra and to minimize Boolean functions.
3. Design and Analyze Sequential Circuits for various cyclic functions.
4. Characterize logic families analyze them for the purpose of AC and DC parameters
5. Design and analyze various combinational circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									2
CO2	3	3	2									2
CO3	3	3	2									2
CO4	3	3	2									2
CO5	3	3	2									2

(A400507) SOCIAL INNOVATION IN PRACTICE
(Common for all branches)

B.Tech II Year I Semester **L T P C**
0 0 2 1

UNIT 1
Identify community issues to be addressed, Requirements Analysis: ExtensiveUser requirements analysis, Generating effective System Requirement document.

UNIT 2
Social Innovation – Case Studies
Presentation of the case studies with a focus on impact and vision on society.

UNIT 3
Process of Social Innovation
Prompts – identifying needs, Proposals – generating ideas, Prototyping – testingthe idea in practice,

UNIT 4
Sustaining-developing a business model, Scaling and diffusion-growing socialinnovations, Systematic change.

UNIT 5
Report writing, Documentation and Panel presentation.

Reference Books:

1. Requirements Analysis: From Business Views to Architecture; David C.Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; BenjaminGidron, YeheskelHasenfeld; Palgrave Macmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets ByDana Brakman Reiser & Steven A. Dean

Course Outcomes:
On Completion of the course, the students will be able to
1. Identify several social issues to be addressed
2. Analyse the impact of social innovations on the society
3. Illustrate the process of social innovation for a community problem
4. Demonstrate the solution from sustainability perspectives.
5. Develop a scalable business model.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						1	2		3	2		
CO2						2	2		2	3		
CO3				2		3	3		2	2		
CO4						2	3	3	2	2		
CO5		2		1		2	3		3	3		

(A400701) ENVIRONMENTAL SCIENCES
(MANDATORY COURSE)

B.Tech II Year I Semester.

L	T	P	C
2	0	0	0

UNIT-I

Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features,structure, and functions of ecosystems. Bio geo chemical cycle, Classification of Eco system.

UNIT-II

Natural Resources, Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer – pesticide problems, Forest resources, Use and over-exploitation. Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

UNIT-III

Biodiversity and its conservation, Value of bio-diversity -consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wildlife, loss of species, seeds, etc. Conservation of bio-diversity – Insitu and Ex-situ conservation.

UNIT-IV

Environmental Pollution –Local and Global Issues, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion. Environmental case studies.

UNIT-V

Environmental Problems in India, Drinking water, sanitation and public health, Effects of the activities onthe quality of environment, Water scarcity and groundwater depletion, Controversies on major dams – resettlement and rehabilitation of people: problems and concerns, Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth, Equitableuse of resources for sustainable life styles, Environmental Impact Assessment.

TEXTBOOKS:

1. Environmental Science - Y. Anjaneyulu, B S Publications.
2. Environmental studies-Deekshadave, Cengage learning India Pvt. Ltd.,

REFERENCE BOOKS:

1. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
2. Cunningham, W.P., et al. Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2003.
3. Environmental sciences and Engineering - P. Venugopal Rao, PHI learning Pvt. Ltd.,

4. Environmental Science and Technology by M. Anji Reddy, B S Publications.

COURSE OUTCOMES:

1. Acquire the knowledge on environment.
2. Acquire the knowledge of various Natural Resources
3. Understand the importance of conservation and preserve the bio-diversity
4. Understand the hazardous effects of environmental pollution.
5. Develop skills in understanding of various environmental problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			**2**				**3**					**1**
CO2			**2**				**3**					**1**
CO3			**2**				**3**					**1**
CO4			**2**				**3**					**1**
CO5			**2**				**3**					**1**

(A405306) DISCRETE MATHEMATICS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

UNIT - I

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT - III

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as PartiallyOrdered Sets, Boolean algebra.

UNIT - IV

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT - V

Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits,Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel,Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearsoneducation, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

Course Outcomes:

1. Understand and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1									1
CO2		2	3	1								1
CO3		2	3	1								1
CO4		1	2									1
CO5		2	3	1								1

(A412303) AUTOMATA THEORY AND COMPILER DESIGN

B.Tech. II Year II Sem

L	T	P	C
3	0	0	3

UNIT – I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.
Nondeterministic Finite Automata: Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.
Deterministic Finite Automata: Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with Є-transitions to NFA without Є-transitions. Conversion of NFA to DFA

UNIT – II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.
Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.
Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT – III

Push Down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA and CFG's, Acceptance by final state
Turing Machines: Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine
Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines

UNIT – IV

Introduction: The structure of a compiler,
Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex,
Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers

UNIT – V

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.
Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code
Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

TEXT BOOK:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E.

Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, 2nd Edition, Pearson.
2. Introduction to Formal languages Automata Theory and Computation, Kamala Krithivasan, Rama R, Pearson
3. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
4. lex & yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly Compiler Construction, Kenneth C. Louden, Thomson. Course Technology.

Course Outcomes

1. Able to employ finite state machines for modeling and solving computing problems.
2. Able to design context free grammars for formal languages.
3. Able to distinguish between decidability and undecidability.
4. Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
5. Acquire skills in using lex tool and design LR parsers

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**1**	**3**									**1**
CO2		**1**	**3**									**1**
CO3		**2**		**3**								**1**
CO4	**1**	**2**										**1**
CO5		**1**	**2**		**2**							**1**

(A405305) OPERATING SYSTEMS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

UNIT - I

Operating System - Introduction, Structures - Simple Batch, Multi-programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT - V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

Disk Scheduling Algorithms

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition,John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition–2005,Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education

Course Outcomes:

1. Demonstrate the knowledge of the components of computers and their respective roles in computing
2. Explain CPU Scheduling Algorithms and explain the methods for handling Deadlocks.
3. Explain Process Management and Synchronization and Demonstrate Inter process Communication.
4. Analyze various Memory Management and Allocation Methods.
5. Discuss File System Interface and Operations.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**	**2**									**2**
CO2	**1**	**1**	**2**									**2**
CO3	**1**	**1**	**2**		**2**							**2**
CO4	**1**	**1**	**2**		**2**				**1**			**2**
CO5	**1**	**1**	**2**		**2**				**1**			**2**

(A405304) DATABASE MANAGEMENT SYSTEMS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and EntitySets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/alteringtables and views.

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and

EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL,triggers, Procedures, Cursors and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),

B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc-Graw Hill

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

Course Outcomes:

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Familiarize the students with a good formal foundation on the relational model.
3. Master the basics of SQL for retrieval and management of data.
4. Be acquainted with the basics of transaction processing and concurrency control.
5. Familiarity with database storage structures and access techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											**2**
CO2	**1**	**2**	**1**									**2**
CO3	**1**	**2**	**2**	**1**	**3**							**2**
CO4	**1**	**2**	**2**	**1**	**3**							**2**
CO5	**1**	**1**	**1**		**3**							**2**

(A412304) JAVA PROGRAMMING

B.Tech. II Year II Sem

L	T	P	C
2	0	0	2

UNIT – I

Foundations of Java: History of Java, Java Features, Variables, Data Types, Operators, Expressions, Control Statements. Elements of Java - Class, Object, Methods, Constructors and Access Modifiers, Generics, Inner classes, String class and Annotations.

OOP Principles: Encapsulation – concept, setter and getter method usage, this keyword. Inheritance - concept, Inheritance Types, super keyword. Polymorphism – concept, Method Overriding usage and Type Casting. Abstraction – concept, abstract keyword and Interface.

UNIT – II

Exception Handling: Exception and Error, Exception Types, Exception Handler, Exception Handling Clauses – try, catch, finally, throws and the throw statement, Built-in-Exceptions and Custom Exceptions.

Files and I/O Streams: The file class, Streams, The Byte Streams, Filtered Byte Streams, The Random Access File class.

UNIT – III

Packages- Defining a Package, CLASSPATH, Access Specifiers, importing packages. Few Utility Classes - String Tokenizer, BitSet, Date, Calendar, Random, Formatter, Scanner.

Collections: Collections overview, Collection Interfaces, Collections Implementation Classes, Sorting in Collections, Comparable and Comparator Interfaces.

UNIT – IV

Multithreading: Process and Thread, Differences between thread-based multitasking and process based multitasking, Java thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication.

Java Database Connectivity: Types of Drivers, JDBC architecture, JDBC Classes and Interfaces, Basic steps in Developing JDBC Application, Creating a New Database and Table with JDBC.

UNIT – V

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Layout Manager Classes, Simple Applications using AWT and Swing.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes.

TEXT BOOK:

1 Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2 Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

Course Outcomes:

1. Able to solve real world problems using OOP techniques.
2. Able to solve problems using exception handling java and I/O classes.
3. Able to solve problems using packages and collections.
4. Able to develop multithreaded applications and database connectivity.
5. Able to design GUI based applications with event handling.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**										**1**
CO2	**1**	**2**	**3**		**1**							**1**
CO3	**1**	**2**	**3**		**1**							**1**
CO4	**1**	**2**	**3**		**1**							**1**
CO5		**1**	**2**		**1**							**1**

(A412502) OPERATING SYSTEMS LAB

B.Tech. II Year II Sem

L	T	P	C
0	0	2	1

List of Experiments

1. a) Demonstrate the Installation & Configuration of Linux Operating Systems.
   b) Explore the following Linux File System commands.
   i) pwd ii) cd iii) mkdir iv) rmdir v) ls vi) cp vii) mv viii) rm ix) cat x) more xi) grep
2. Write C programs to simulate the following CPU Scheduling algorithms
   a) FCFS b) SJF c) Round Robin d) priority
3. Write programs using the I/O system calls of UNIX/LINUX operating system
   (open, read, write, close, fcntl, seek, stat, opendir, readdir)
4. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
5. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
6. Write C programs to illustrate the following IPC mechanisms
   a) Pipes b) FIFOs c) Message Queues d) Shared Memory
7. Write C programs to simulate the following memory management techniques
   a) Paging b) Segmentation
8. Write C programs to simulate Page replacement policies
   a) FCFS b) LRU c) Optimal
9. Simulate the following File Allocation Strategies
   a). Sequential b). Indexed c. Linked
10. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or directory and reports accordingly. Whenever the arguments is a file it reports number of lines present in it.
11. Simulate the following disk scheduling algorithms
    a). SCAN b).CSCAN c).SSTF

Textbooks

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

Reference Books

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education

Course Outcomes:

1. Understand the installation and configuration of Operating System.
2. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
3. Understand and implement C programs for I/O system call
4. Able to implement producer consumer problem using semaphores.
5. Understand and analyse to implement IPC mechanisms using C.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**1**			**1**							**1**
CO2	**1**	**2**	**3**		**1**							**1**
CO3	**1**	**2**	**3**		**1**							**1**
CO4		**2**	**3**		**1**							**1**
CO5		**2**	**3**		**1**							**1**

(A412503) DATABASE MANAGEMENT SYSTEMS LAB

B.Tech. II Year II Sem

L	T	P	C
0	0	2	1

List of Experiments:

1. Concept design with E-R Model

Draw an ER diagram for the following

There are two entity sets ***Employee*** and ***Department***. These entity sets are participating in a relationship ***works in*.** The relationship set is converted into relation with attributes EmpNo from ***Employee*** relation, D_id from ***Department*** relation and ***Since***, the attribute of the relationship set itself.

2. Relational Model

a. Convert the above ER diagram into Relational Model

3. Normalization

Consider the following table.

Eid	E.Name	Ph.no	Proj Id	Proj Name	Proj Leader	Emp City	City Zip
101	John	98765623,998234123	P03	Project103	Grey	ModelTown	110033
102	John	89023467	P01	Project101	Christian	Badarpur	110044
103	Ryan	76213908	P04	Project104	Hudson	Naraina	110028
104	stephine	98132452	P02	Project102	Petro	HariNagar	110064

a) Normalize the given Relation. Consider the given schema is in first normal form and
Schema(Student id ,Student name, Project Id, Project name, City, country, ZIP)
Primarykey(Student id,Project id)
Fd's: Project Id-→ Project name
country-→ZIP,ZIP

b) Normalize the given Table to the BCNF
Consider the set of Functional Dependencies..
Eid → EName, Ph.no, Empcity, CityZip
ProjId → ProjName, ProjLeader
EmpId,ProjId → ProjLeader
EmpCity → CityZip
ProjId → ProjLeader

PrimaryKey = (EmpId, ProjId)

4.Practicing DDL commands

5.Practicing DML commands

1. a. Create a user and grant all permissions to the user.
   b. Insert the any three records in the employee table and use rollback. Check the result.
   c. Add primary key constraint and not null constraint to the employee table.
   d. Insert null values to the employee table and verify the result.

2. a. Create a user and grant all permissions to the user.
   b. Insert values in the department table and use commit.
   c. Add constraints like unique and not null to the department table.
   d. Insert repeated values and null values into the table.
3. a. Create a user and grant all permissions to the user.
   b. Insert values into the table and use commit.
   c. Delete any three records in the department table and use rollback.
   d. Add constraint primary key and foreign key to the table
4. a. Create a user and grant all permissions to the user.
   b. Insert records in the sailor table and use commit.
   c. Add save point after insertion of records and verify save point.
   d. Add constraints not null and primary key to the sailor table.
5. a. Create a user and grant all permissions to the user.
   b. Use revoke command to remove user permissions.
   c. Change password of the user created.
   d. Add constraint foreign key and not null.
6. a. Create a user and grant all permissions to the user.
   b. Update the table reserves and use savepoint and rollback.
   c. Add constraint primary key, foreign key and not null to the reserves table
   d. Delete constraint not null to the table column

6.A. Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)
6.B. Nested, Correlated subqueries

a) Find the Sid's of sailors who have reserved a red or a green boat.
b) Find the names of sailors who have reserved a red and a green boat.
c) Find the names of sailors who have reserved a red but not green boats.
d) Find all sids of sailors who have a rating of 10 or reserved boat 104.
e) Find the names of sailors who have reserved boat 103 using independent nested query.
f) Find the names of sailors who have reserved a red boat.
g) Find the names of sailors who have not reserved a red boat.
h) Find the names of sailors who have reserved boat number 103 using correlated nested query.
i) Find sailors whose rating is better than some sailor called 'Horatio'.
j) Find the sailors with the highest rating.
k) Find the names of sailors who have reserved both a red and a green boat using nested queries.
l) Find the names of sailors who have reserved all boats.

7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.

a) who is the youngest sailor
b) Find the name of the sailor who have maximum rating
c) What is the average rating of all Sailors?
d) How many sailors are there with the rating above 7?
e) List the number of customers in each country, sorted from high to low

8. Triggers (Creation of insert trigger, delete trigger, update trigger)

1. a. Create a pl/sql trigger which will calculate the total marks and percentage of students after insert/update the details of a student in database.
   b. Write a trigger that keeps backup of deleted records of emp_trig table. Deleted records of emp_trigger inserted in emp_backup table.

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.

Passenger (Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) Not NULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) Not NULL);

a. Write a Insert Trigger to check the Passport_id is exactly six digits or not.

b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passenger respectively.

9. Procedures and functions

a. Create a procedure which displays employee salary for given employee number using out variable
b. Write a pl/sql block which displays the department name for department 40.
c. Create a procedure to check whether the given number is prime or not
d. Create a function which returns week day of a given date
e. Create a function which returns number of sailors for a given rating level.
f. Create a procedure to find the lucky number of a given birth date
g. Create a function which returns average age of sailors for a given rating level.

10. Usage of Cursors

a. Display the employee names and their salary for the accepted department number.
b. Display the top N earners for an accepted department number.
c. To write a Cursor to display the list of employees who are working as a Managers or Analyst.
d. Write a Cursor to find employee with given job and deptno.
e. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated we get a message 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table.

11. Packages

a. creates HR package which contains Hire and Fire functions.

Hire function adds the details of employee and Fire function deletes the details of Employee.

Textbooks

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

Reference Books

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

Course Outcomes:

1. Construct E-R model and Relational model for different database applications.
2. Apply normalization techniques for refining of databases.
3. Implement the basic knowledge of SQL queries as nested queries, correlated sub queries.
4. Write & execute DDL and DML command in queries on the given Database
5. Practice various triggers, procedures, packages and cursors using PL/SQL.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3									1
CO2	1	2	3	1	1							1
CO3	1	2	3		1							1
CO4		2	3	1	1							1
CO5		2	3	1	1							1

(A412504) JAVA PROGRAMMING LAB

B.Tech. II Year II Sem

L	T	P	C
0	0	2	1

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program to demonstrate the OOP principles. [i.e., Encapsulation, Inheritance, Polymorphism and Abstraction]
3. Write a Java program to handle checked and unchecked exceptions. Also, demonstrate the usage of custom exceptions in real time scenario.
4. Write a Java program on Random Access File class to perform different read and write operations.
5. Write a Java program to demonstrate the working of different collection classes. [Use package structure to store multiple classes].
6. Write a program to synchronize the threads acting on the same object. [Consider the example of any reservations like railway, bus, movie ticket booking, etc.]
7. Write a program to perform CRUD operations on the student table in a database using JDBC.
8. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
9. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. [Use Adapter classes]

TEXT BOOK:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

Reference Books:

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

Course Outcomes:

1. Understand the operations of Net bean/Eclipse tools with simple application.
2. Write and execute Java applications using Encapsulation, Inheritance, Polymorphism and Abstraction technique.

3. Able to write programs using synchronize the threads and with Exceptional Handling.
4. Write and execute Java applications using collections and I/O classes.
5. Design Java Applications using JAVA GUI components with mouse events and test them by execution.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**		**1**							**1**
CO2	**1**	**2**	**3**	**1**	**1**							**1**
CO3	**1**	**2**	**3**	**1**	**1**							**1**
CO4		**2**	**3**	**1**	**1**							**1**
CO5		**2**	**3**	**1**	**1**							**1**

(A405510) DATA VISUALIZATION - R PROGRAMMING

B.Tech. II Year II Sem

L	T	P	C
0	0	2	1

Lab Problems:

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau,
   creating basic charts(line, bar charts, Tree maps),Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCE BOOKS:

1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.

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

1. Understand How to import data into Tableau.
2. Understand Tableau concepts of Dimensions and Measures.
3. Develop Programs and understand how to map Visual Layouts and Graphical Properties.
4. Create a Dashboard that links multiple visualizations.
5. Use graphical user interfaces to create Frames for providing solutions to real world problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

(A400702) GENDER SENSITIZATION
(Common to all branches)

B.Tech II Year II Semester **L T P C**
2 0 0 0

UNIT-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood-Growing up Male, First lessons in Caste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences Declining Sex Ratio-Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn"t Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.–GenderDevelopment Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender andMainstreaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: SpeakingOutIs Home a Safe Place? –When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for myLife…."

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature – Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters-Mothers and Fathers-Rosa ParksThe Brave Heart.

REFERENCE BOOKS

1. Towards a World of Equals: A Bilingual Textbook on Gender, A. Suneetha, Uma Bhrugub and a, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, DeepaSreenivas and Susie Tharu published by Telugu Akademi, Telangana Government, 2015.

Course Outcomes:

On completion of the course students will be able to

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legalaspects of gender. (This will be achieved through discussion of materials derived from research, facts,everyday life, literature and film).
3. Students will attain a finer grasp of how gender discrimination works in our society and acquire insight into the gendered divisin of labour and its relatuion to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals.

5. Students will develop a sense of appreciation of women in all walks of life by going through accounts of studies and movements as well as the new laws that provide protection and relief to women.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	-	-	-
CO4	-	-	-	2	-	-	-	-	-	-	-	-
CO5	-	-	3	-	-	--	-	-	-	-	-	-

(A404601)FUNDAMENTALS OF INTERNET OF THINGS
(Open Elective-I)

B. Tech.

L	T	P	C
3	0	0	3

UNIT – I

Introduction to Arduino: Introduction to Arduino Uno, Features, Pin functionality, Basic Arduino Programming: Interfacing LEDs, Switches using Digital I/O Read/Write, Acquiring and generating signals using Analog I/O Read/Write, Serial functions.

UNIT – II

Introduction to Raspberry Pi: Introduction to Raspberry Pi, Pin functionality, Revision of Python Programming; Raspberry Pi commands, GPIO programming.
Other Open Source Devices: Features and pin functions of NodeMCU, ESP8266, ESP32.

UNIT - III

Introduction to IOT: Terms and definitions, Logical design of IoT, IOT Reference Model;
IOT and M2M: Introduction to M2M, Difference between IoT and M2M and other types;
IOT Servers and Cloud Offerings: IoT enabling technologies – Cloud Computing; Introduction to Cloud Storage/Services – Google, Microsoft Azure, IBM, Amazon Web services for IOT, Setting up to read and write using Thingspeak;

UNIT – IV

IOT & Communication Protocols: Serial –RS 485, IEEE1394 Firewire, I2C, SPI, USB,CAN; Wireless sensor networks and its technologies, IOT Protocols.

UNIT – V

Domain Specific IOT Applications & Case Studies:
IOT Application & case studies for Agriculture, Smart Cities & Transport, Home Automation, Environment, Retail, Logistics, Health, Life style, Industry – Energy;

TEXT BOOKS:

1. Srinivasa K G, Siddesh G M, Hanumantha Raju R, Internet of Things, Cengage, 2019.

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014
2. Jeremy Blum, Exploring Arduino: Tools and Techniques for Engineering Wizardry, Wiley, 2013.
3. Simon Monk, Raspberry Pi Cookbook, O'Reilly 3rd Edition, 2019
4. Michael Margolis, Arduino Cookbook, 2nd Edition, December 2011, O'Reilly Media, Inc.
5. Rahul Dubey, An Introduction to Internet of Things – Connecting Devices, Edge Gateway, and Cloud with Applications, Cengage, 2019.

Course Outcomes: Students will be able to

1. Have knowledge of programming open source Edge devices like Arduino, Raspberry Pi.
2. Apply the knowledge of arduino and raspberry pi with clouds for IOT applications.
3. Analyze the different communication and IOT protocols.
4. Aware of various cloud services and providers.
5. Understand various IOT implementations in different domains.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		2	1							1
CO2		2										1
CO3				3	1	1						1
CO4		3										1
CO5			2	3	1							1

(A404602) PRINCIPLES OF DIGITAL SIGNAL PROCESSING
(Open Elective-I)

	L	T	P	C
B. Tech.	**3**	**0**	**0**	**3**

UNIT-I

Introduction to Signal and Systems

Basic Signals and Systems – properties and basic operations-1-D Signals and Filters – Random Signals - Multi-dimensional Signals – Analog and Digital signals and their conversion techniques Convolution process, Filtering process, Z-transform concepts.

UNIT-II

Time domain analysis and Characteristics

Correlation and Discrete sequences: notation, signal characteristics, and operations Discrete linear time invariant systems -Properties and analysis of discrete linear time invariant systems Periodic sampling: aliasing and lowpass filtering.

UNIT-III

Frequency domain Analysis

Discrete Fourier transforms (DFT) DFT properties: symmetry, linearity, magnitudes, frequency axis, and shifting Inverse DFT-Fast Fourier transform(FFT):relationship to DFT, implementation considerations, radix-2 algorithm, and input/output indexing FFT: butterfly algorithm structures.

UNIT-IV

FIR filter design

FIR filters–Introduction-Basic properties-Design using Hamming, Hanning Windows-Realization of FIR filters.

UNIT-V

IIR filter design

Review of design of analogue Butterworth Filters, - Design of IIR digital filters using impulse invariance technique-Realization using direct, cascade and parallel forms.

Text Books:

1. Richard G. Lyons, Understanding Digital Signal Processing, Third edition, Prentice-Hall, 2011.2. Introduction to Digital Signal Processing, J.Proakis &E.Manolakis, MacMillan, 2007 (4thEdition)

References:

1.S.Salivahanan,A.Vallavaraj,C.Gnanapriya,DigitalSignalProcessing,TMH/McGrawHillInternational,2007
2.E.C.I feachor and B.W.Jervis,"Digitalsignalprocessing-Apracticalapproach",Secondedition,Pearson,2002.

Course Outcomes:

Students will be able to

1. Characterize discrete time signals and LTI signal processing systems mathematically.
2. Analyze the functions performed by simple discrete-time systems.
3. Develop the discrete Fourier transform (DFT) over time domain signals, its applications, and its implementation by FFT techniques.
4. Apply the design techniques for FIR type digital filters known as the ―windowing method.
5. Design IIR type digital filters over the given specifications

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**										**1**
CO2	**3**	**3**										**1**
CO3	**3**	**3**	**2**									**1**
CO4	**3**	**3**	**2**	**2**								**1**
CO5	**3**	**3**	**2**	**2**								**1**

****END****

(A402601)RENEWABLE ENERGY SOURCES
(OPEN ELECTIVE-I OFFERED BY EEE DEPT)

	L	T	P	C
B. Tech.	**3**	**0**	**0**	**3**

UNIT I: GLOBAL AND NATIONAL ENERGY SCENARIO
Overview of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy-concept of Hybrid systems.

UNIT II: SOLAR ENERGY
Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT III: WIND ENERGY
Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Windmill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT IV: BIOGAS
Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermochemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

UNIT V: OCEAN ENERGY
Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.
Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.
Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

TEXT BOOKS
1. Renewable Energy Sources / Twidell, J.W. and Weir, A./ EFN Spon Ltd., 1986.
2. Non-Conventional Energy Sources / G.D Rai/ Khanna Publishers

Course Outcome:
After successful completion of this course, the students can be able to:
1. Understand the importance of renewable energy sources
2. Explain the operation of solar energy system
3. Illustrate various wind energy conversion systems
4. Explain the operation Bio gas conversion
5. Explain the principle and operation of Ocean wave energy conversion.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A402602) BASICS OF POWER ELECTRONICS & DRIVES
(OPEN ELECTIVE-1)

B. Tech

L	T	P	C
3	0	0	3

UNIT I: POWER SEMICONDUCTOR DEVICES
Power Semiconductor Devices Construction and Characteristics of Power diodes, Power Transistors, Power MOSFET, Insulated Gate Bipolar transistors (IGBTs) Introduction to Thyristor family: SCR, DIACs, TRIACs.

UNIT II: PHASE CONTROLLED (AC TO DC) CONVERTERS
Principle of phase-controlled converter operation; Operation of 1-phase half wave converter with R, RL and RLE load; 1- phase full wave converter, Bridge Configuration; Operation with R, RL, RLE load; Operation of 1-phase Semi-converter/ Half controlled converter:

UNIT III: THREE -PHASE CONVERTERS
Operation of half wave converter: Full wave fully controlled converters: Semi-controlled converter; Dual Converter: Principle and operation; Applications of AC-DC converters

UNIT IV: DC TO DC CONVERTERS
The chopper, Basic principle of DC chopper, Classification of DC choppers, Control strategies Basic DC-DC converter (switch regulator) topologies: Principle, operation Step-down (Buck), Step-up (Boost), Step up/down (Buck-Boost), Continuous conduction and Discontinuous conduction operation, Two zone operation, Four quadrant operation (Operating modes),

UNIT V: POWER CONVERTERS FED DRIVES
Single phase separately excited drives: Half Wave converter, Semiconverter and Fully Controlled converter based drives; Braking operation of separately excited drive Semi-converter and Fully Controlled converter based drives 3-phase separately excited drives: Half Wave converter, Semi-converter and Fully Controlled converter based drives; Principle of power control (motoring control) of separately excited and series motor with DC-DC Converter;

Text books:

1. M D Singh and K B Khanchandani, “Power electronics”, TMH, New Delhi, 2nd ed., 2007.
2. P.S. Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2012..
3. Muhammad H. Rashid, “Power Electronics - Circuits, Devices and Applications”, Prentice Hall of India, 3rd ed., 2003.

Reference Books:

1. VedamSubramanyam, “Power Electronics – Devices, Converters and Applications”, New Age International Publishers Pvt. Ltd., Bangalore, 2nd ed. 2006.
2. Ned Mohan, Undeland and Robbins, “Power Electronics – Converters, Applications and Design”, John Willey & sons, Inc., 3rd ed., 2003.
3. V.R.Moorthi, “Power Electronics”, Oxford University press, 2005.
4. G..K. Dubey, S.R. Doradla, A. Joshi, and R.M.K. Sinha, “Thyristorised Power Controllers”, New Age International Ltd. Publishers, 1986 (Reprint 2008).
5. P.T. Krein, “Elements of Power Electronics”, Oxford University Press, 1998.
6. G..K. Dubey, “ Fundamentals of Electrical Drives”, Narosa Publishing House, New Delhi, 2nd ed. 2001

Course Outcome:
After successful completion of this course, the students can be able to:
1. Explain the construction and characteristics of Power semiconductor devices
2. Analyze the operation of single phase and three phase ac-to-dc converters.
3. Analyze various three phase converters
4. Compare the various types of dc-to-dc converters.
5. Apply the knowledge of power electronic converter for various applications.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

END

(A405604) JAVA PROGRAMMING
(OPEN ELECTIVE-I)

B. Tech

L	T	P	C
3	0	0	3

UNIT-I
Introduction: Java Essentials, JVM, Java Features, Creation and Execution of Programs, Data Types, Type Conversion, Casting, Conditional Statements, Loops, Branching Mechanism, Classes, Objects, Class Declaration, Creating Objects, Method Declaration and Invocation, Method Overloading, Constructors– Parameterized Constructors, Constructor Overloading, Cleaning-up unused Objects, Class Variables & Methods-static Keyword, this Keyword.

UNIT–II
Arrays: One-Dimensional Arrays, Two-Dimensional Arrays, Command-Line Arguments, Inner Class. **Inheritance**: Introduction, Types of Inheritance, extends Keyword, Examples, Method Overriding, super, final Keywords, Abstract classes, Interfaces, Abstract Classes Verses Interfaces.

UNIT–III
Packages–Creating and Using Packages, Access Protection, Wrapper Classes, String Class, StringBuffer Class. **Exception**: Introduction, Types, Exception Handling Techniques, User-Defined Exception.

UNIT-IV
Multithreading: Introduction, Main Thread, Creation of New Threads – By Inheriting the Thread Class or Implementing the Runnable Interface, Thread Lifecycle, Thread Priority, Synchronization.

UNIT–V
java.io Package, File Class, FileInputStream Class, FileOutputStream Class, Scanner Class, BufferedInputStream Class, BufferedOutputStream Class, RandomAccessFile Class.

Text Books:
1.Sachin Malhotra, Saurabh Choudhary, Programming in Java (2e), Oxford publications.

Reference Books:
1.Herbert Schildt, Java: The Complete Reference (9e), McGraw Hill Education;
2. C. Thomas Wu, An introduction to object-oriented programming with Java (5e), McGraw-Hill Education;

Course Outcomes
The student shall be able to:
1. Explain the OOPs concepts.
2. Describe various types of Inheritance in Java.
3. Develop robust Java applications using Packages, Exceptions.
4. Implement Java applications using Java Threads.
5. Design Java applications with various modes of Input and output

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2		2							1
CO2	1	2	2		2							1
CO3	1	2	2	2	2							2
CO4	1	2	2	2	2					2		2
CO5	1	2	2	2	2					2		2

(A405602) FUNDAMENTALS OF OPERATING SYSTEMS
(OPEN ELECTEIVE-I)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT - I
Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II
CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec
Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III
Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

UNIT – IV
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT – V
Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms

TEXTBOOKS:
1.Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2.Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS:
1.Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2.Operating System A Design Approach- Crowley, TMH.
3.Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4.UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5.UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

Course Outcomes:
1. Demonstrate the knowledge of the components of computers and their respective roles in computing.
2. Explain CPU Scheduling Algorithms and Explain the methods for handling Deadlocks.
3. Explain Process Management and Synchronization and Demonstrate Inter process Communication.
4. Analyze various Memory Management and Allocation Methods.
5. Discuss File System Interface and Operations

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**											
CO2	**1**	**2**	**2**	**2**								
CO3	**1**	**2**	**2**	**2**								
CO4	**1**	**2**	**2**	**2**								
CO5	**1**	**2**	**2**	**2**								

END

(A462601) FUNDAMENTALS OF CYBER SECURITY
(OPEN ELECTEIVE-I)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT – I: Introduction to Cyber Crime and Security: Introduction Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, CIA Triad, Who are Cybercriminals, Classifications of Cybercrimes, E-mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/ Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/ Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Credit Card Frauds.

UNIT – II: Cyber Offenses: How Criminals Plan Them: Introduction, Categories of Cybercrime, How Criminals Plan the Attacks, Reconnaissance, Passive Attacks, Active Attacks, Scamming and Scrutinizing Gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Classification of Social Engineering,

UNIT – III: Tools and Methods Used in Cyber Crime and Security Measures – I: Introduction, Proxy Servers and Anonymizers, Phishing, How Phishing Works, Password Cracking, Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords, Keyloggers and Spywares, Software Keyloggers, Hardware Keyloggers, Antikeylogger.

UNIT – IV: Tools and Methods Used In Cyber Crime and Security Measures – II: DoS and DDoS Attacks, DoS Attacks, Classification of DoS Attacks, Types of Levels of DoS Attack, Tools Used to Launch DoS Attacks, DDoS Attacks, How to protect from DoS/DDoS Attacks, SQL Injection, Steps for SQL Injection Attack, How to Prevent SQL Injection Attacks.

UNIT – V: Cybercrime and Cyberterrorism: Social, Political, Ethical and Psychological Dimensions: Introduction, Intellectual Property in the Cyberspace, Copyright, Patent, Trademarks, Trade Secret, Trade Name, Domain Name, The Ethical Dimension of Cybercrimes, Ethical Hackers: Good Guys in Bad Land, The Psychology, Mindset and Skills of Hackers and Other Cybercriminals.

TEXTBOOKS:

1. Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley
2. Cyber Law & Cyber Crimes by Advocate Prashant Mali; Snow White publications, Mumbai

REFERENCES:

1. Management of Information Security, M. E. Whitman, H. J. Mattord, Nelson Education, CENGAGE Learning, 3rd Edition, 2011
2. Guide to Computer Forensics and Investigations, B. Nelson, A. Phillips, F. Enfinger, C. Steuart, Nelson Education / CENGAGE Learning, 4th Edition, 2010
3. Information Technology Law and Practice by Vakul Sharma; Universal Law Publishing Co. Pvt. Ltd

COURSE OUTCOMES:

After completion of the course, the student should be able to

CO-1: Categorize cyber-crimes and an understanding of social, political, ethical and psychological dimensions of cyber security

CO-2: Demonstrate cyber offenses tools, methods used in cyber crime

CO-3: Document an appropriate procedure of Risk Management and Security Standards

CO-4: Understand cyber laws and Indian Information Technology Act

CO- PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A467801) DATA SCIENCE USING R
(OPEN ELECTEIVE-I)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT - I

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

Basics of R: Introduction, R- Environment Setup, Programming with R, Basic Data Types.

UNIT - II

Data Types & Statistical Description

Types of Data: Attributes and Measurement, what is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, and Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,

Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.

Data Visualization: Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXTBOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed.The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
4. Paul Teetor, "R Cookbook", O'Reilly, 2011.

Course Outcomes: After completion of the course, the student should be able to

1. Understand basic terms what Statistical Inference means.
2. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
3. describe the data using various statistical measures
4. utilize R elements for data handling.
5. Perform data reduction and apply visualization techniques.

CO- PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A466601) ROBOTICS
(OPEN ELECTEIVE-I)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

Unit 1:
Introduction: Introduction to Robotics Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction,the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Unit 2:
Need of AI in Robotics: History, state of the art, Need for AI in Robotics. Thinking and acting humanly, intelligent agents, structure of agents.

Unit 3:
Game Playing: AI and game playing, plausible move generator, static evaluation move generator, game playing strategies, problems in game playing.

Unit 4:
Robotics fundamentals: Robot Classification, Robot Specification, notation, kinematic representations and transformations, dynamics techniques; trajectory planning and control.

Unit 5:
Robotics and Its applications: DDD concept, Intelligent robots, Robot Anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple Problems-Specifications of Robot-Speed of Robot, Robot joints and links-Robot classifications Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system.

Textbooks/ References:
1. Robotics, Vision and Control: Fundamental Algorithms in MATLAB, Peter Corke, Springer, 2011.
2. Robotics: Everything You Need to Know About Robotics from Beginner to Expert, Peter McKinnon, Createspace Independent Publishing Platform, 2016.
3. Introduction to AI Robotics, Second Edition, By Robin R. Murphy, MIT press, 2001.
4. Artificial Intelligence for Robotics: Build intelligent robots that perform human tasks using AI techniques, Francis X. Govers, Packt Publishers, 2018.

Course Outcome:
1. Understanding the fundaments related to robotics
2. Identify the Need of AI in Robotics
3. Understanding the strategies related to game playing
4. Apply and solve spatial transformation, kinematics, robot dynamics problems, generate joint trajectory for path planning
5. Understand the present &future applications of a robot**.**

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**2**	**3**									
CO2	**2**	**2**	**3**		**3**							**2**
CO3	**2**	**2**	**3**		**3**			**2**				**2**
CO4	**2**	**2**	**3**					**2**				**2**
CO5	**2**	**2**	**3**					**2**				**2**

(A403601) FUNDAMENTALS OF ENGINEERING MATERIALS
(Open Elective-I)

B. Tech

L	T	P	C
3	0	0	3

UNIT – I
Structure of Metals: Crystallography, Miller's indices, Packing Efficiency, Density calculations. Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods. Constitution of Alloys: Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

UNIT –II
Phase Diagrams: Construction and interpretation of phase diagrams, Phase rule. Lever rule. Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

UNIT – III
Steels: Iron-Carbon Phase Diagram and Heat Treatment: Study of Fe-Fe3C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening and Tempering of steels, Hardenability. Alloy steels.

UNIT – IV
Cast Irons: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron. Engineering Materials-III: Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys.

UNIT – V
Ceramics, Polymers and Composites: Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties and applications of composites. Classification, Properties and applications of Polymers.

TEXT BOOKS:
1. Material Science and Metallurgy/ Kodgire
2. Essentials of Materials Science and engineering / Donald R. Askeland / Thomson.

REFERENCE BOOKS:

1. Introduction to Physical Metallurgy / Sidney H. Avner.
2. Materials Science and engineering / William and callister.
3. Elements of Material science / V. Rahghavan

Course Outcomes:
At the end of the course the students are able to:
1. Identify the crystalline structure of steel.
2. Understand the theory of time temperature and transformation
3. Determine of different uses of heat treatment in steel.
4. Distinguish between the various forms of steel.
5. Understand the properties of non-ferrous alloys and uses of composite materials.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2				1						1
CO2	3	2				1						1
CO3	3	2				1						1
CO4	3	2				1						1
CO5	3	2				1						1

****END****

(A403602) BASICS OF THERMODYNAMICS
(Open Elective-I)

B. Tech

L	T	P	C
3	0	0	3

UNIT – I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle, Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility.

UNIT - II

Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale.

UNIT – III

First and Second Laws of Thermodynamics: First Law: Cycle and Process, Specific Heats (cpand cv), Heat interactions in a Closed System for various processes, Limitations of First Law,Concept of Heat Engine (H.E.) and Reversed H.E. (Heat Pump and Refrigerator), Efficiency/COP, Second Law: Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, Statement of Clausius Inequality, Property of Entropy, T-S and P-V Diagrams

UNIT - IV

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const.

Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet BulbTemperature, Dew point Temperature, , Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation ,Psychrometric chart

UNIT - V

Power Cycles: Otto, Diesel cycles - Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis

Refrigeration Cycles: Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1. Basic Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Engineering Thermodynamics / chattopadhyay/ Oxford

REFERENCE BOOKS:

1. Thermodynamics for Engineers / Kenneth A. Kroos, Merle C. Potter/ Cengage
2. Thermodynamics /G.C. Gupta /Pearson

COURSE OUTCOMES:

After completing this course, the students will be able to

1. Apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2. Evaluate changes in thermometric properties of substances.
3. Apply the laws of thermodynamics to different systems.
4. Understand the psychrometric properties of air
5. Compare differ**e**nt air standard cycles.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1	2		2			2
CO2	3	3	2	3	3	1	2		2			2
CO3	3	3	1	3	1	1	2		2			2
CO4	3	3	1	3	1	1	2		2			2
CO5	3	3	1	3	2	1	2		1			2

****END****

(A400601) – BASICS OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT
(Open Elective-I)

L	T	P	C
3	0	0	3

Unit – I: Understanding Supply Chain: Objectives of a Supply Chain, Importance, Stages of Supply Chain, Value Chain Process, Cycle View of Supply Chain Process, Key Issues in SCM, Logistics & SCM, Supply Chain Drivers and Obstacles, Supply Chain Strategies, Strategic Fit, Best Practices in SCM, Obstacles of Streamlined SCM, Green Supply Chain Management, Supply Chain Sustainability.

Unit – II: Logistics: Evolution, Objectives, Components and Functions of Logistics Management, Difference between Logistics and Supply Chain, Distribution related Issues and Challenges. Gaining Competitive Advantage through Logistics Management, Transportation: Functions, Costs, and Mode of Transportation Network and Decision, Models, Containerization, Cross Docking, Reverse Logistics.Outsourcing: Nature and Concept, Strategic Decision to Outsourcing, Third-party Logistics (3PL), Fourth-party Logistics (4PL).

Unit – III: Designing the Supply Chain Network: Designing the Distribution Network, Role of Distribution, Factors Influencing Distribution, Design Options, e-Business and its Impact, Distribution Networks in Practice, Network Design in the Supply Chain, Role of Network, Factors Affecting the Network Design Decisions, Modeling for Supply Chain. Unit – IV: Supply Chain Performance: Bullwhip Effect and Reduction, Performance Measurement: Dimension, Tools of Performance Measurement, SCOR Model. Demand Chain Management, Global Supply Chain, Challenges in Establishing Global Supply Chain, Factors that influence Designing Global Supply Chain Network.

Unit – V: Coordination in a Supply Chain: Importance of Coordination, Lack of Supply Chain Coordination and the Bullwhip Effect, Obstacles to Coordination, Managerial Levels, Building Partnerships and Trust, Continuous Replenishment and Vendor Managed Inventories, Collaborative Planning, Forecasting and Replenishment. Role of Information Technology in Supply Chain, Supply Chain 4.0.

Reference Books

1. IMT Ghaziabad, Advanced Supply Chain Management, Sage Publications, 2021.
2. Rajat K. Basiya, Integrated Supply Chain Management, Sage Publications, 2020.
3. K Sridhara Bhat, Logistics & Supply Chain Management, HPH,1e,2017.
4. Chopra, Sunil, Meindl, Peter and Kalra, D. V., Supply Chain Management: Strategy, Planningand Operation; Pearson Education, 6e, 2016.
5. Altekar, Rahul V, Supply Chain Management: Concepts and Cases; PHI Learning ,1e,2005.
6. Donald J. Bowersox and David J. Closs, Logistical Management" The Integrated Supply Chain Process, TMH, 2017
7. Edward J Bradi, John J Coyle, A Logistics Approach to Supply Chain Management, Cengage Learning, New Delhi, 2012
8. Sunil Chopra and Peter Meindl, Supply chain Management: Strategy, Planning and Operation, Pearson Education, New Delhi 2013

Course Outcomes: Students will be able to:

1. Understand the cyclical perspective of logistics and supply chain process.
2. Learn about the distribution, transportation, warehousing related issues and challenges in supply chain.
3. Appreciate the significance of network design in the supply chain.
4. Gain knowledge of various models / tools of measuring the Supply Chain Performance.
5. Appreciate the role of coordination and technology in supply chain management.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A400602) INDUSTRIAL RELATIONS

L	T	P	C
3	0	0	3

UNIT-I

Overview of Industrial Relations: Meaning & Objectives, Scope, Importance, Approaches to Industrial Relations – Role of Three Actors to Industrial Relations – State, Employer & Employees, Causes for poor IR, Developing sound IR. Ethical approach to IR: Idea of trusteeship – Principles & features, Code of conduct. The industrial policy resolution 1991.ILO in IR. Collective Bargaining (Perspective, Bargaining Structure, Procedure and Machinery for Collective Bargaining) – The Bargaining Process – Strengths and Skills

UNIT-II

Laws on Industrial Relations: The Trade Union Act 1926: Role & function of Trade union, Registration, Rights and privileges, Duties, Dissolution of Trade Unions.

Industrial Disputes Act 1947: Strike, Lockout, Layoff, Retrenchment, Grievance and disciplinary procedures, Penalties, Causes, Tripartite & Bipartite Bodies, Grievance Procedure.

Industrial Employment Act, 1946: Information in standing orders, Procedure for submission

UNIT-III

Laws on Wages, Welfare and Social Security: Minimum Wages Act, 1948, Payment of WagesAct, 1936, Payment of Bonus Act, 1965 Laws on Labour Welfare: The Workmen's Compensation Act, 1923, The Employees' State Insurance Act,1948, The Maternity Benefit Act, 1961.Laws on Social Security: The Employee's Provident Fund Act, 1952, The Payment of Gratuity Act, 1972.

UNIT-IV

Laws on Working Conditions: Factories Act, 1948: Health, Welfare, Safety, Working Hours, Annual Leave with wages, Registers and Records. Contract Labour (Regulation and Abolition) Act, 1986 – Child Labour (Prohibition and Regulation Act, 1986)

UNIT-V

Quality of Work Life and Quality Circles: Meaning of quality of work life – Quality Circles- Objectives- Process, Structure and problems- workers participation in management and quality circles – Concept of empowerment.

Course Outcomes

1. Access the concept and Scope of Industrial Relations and its resolution.

2. Outline the knowledge towards Trade unions, Industrial disputes and GrievanceProcedure.
3. Identify various Laws on Wages, Welfare and Social Security.
4. Illustrate rules and regulations of working conditions.
5. Enlighten on quality standards in industry.

Suggested Reading:

1. ArunMonappa (2020). Industrial Relations. New Delhi: Tata McGraw- Hill PublishingcompanyLtd.
2. Mamoria C.B, Mamoria, G. (2021). Dynamics of Industrial Relations. New Delhi: HimalayanPublications,
3. Padhi,P.K.(2012).Labour&IndustrialLaws.NewDelhi:PHILearningP.Ltd.
4. Kapoor, N.D. (2014). Elements of Mercantile Law. New Delhi: S.Chand&Co.
5. Subramani, P N. &Rajendran, G. (2001). Human Resources Management and IndustrialRelations. New Delhi: Himalaya PublishingHouse.
6. Pylee, P V. & A Simon George. (2007). Industrial relations and personnel Management.New Delhi: Vikas Publishing House Pvt. Ltd., NewDelhi.
7. Verma, P. (1991). Management of Industrial Relations Reading and cases. Oxford and IBHpublications

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A401601)-DISASTER PREPAREDNESS & PLANNINGMANAGEMENT
(Open Elective – I)

B.Tech (CE) VII-Semester **L T P C**

3 0 0 3

UNIT - I:

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT - II

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT - III

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.);health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT - IV

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, foodsafety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT - V

Disasters, Environment and Development - Factors affecting vulnerability such as impact ofdevelopmental projects and environmental modifications (including of dams, landuse changes,urbanization etc.), sustainable and environmental friendly recovery; reconstruction and developmentmethods.

TEXT BOOKS:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, RajatPublication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCE BOOKS:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State ofCalifornia, EMSA no.214, June 2003
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A401602)- ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective – I)

B.Tech (CE) VII –Semester **L T P C**

3 0 0 3

UNIT - I:

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II

EIA Methodologies: Environmental attributes -Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief&
Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S.Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co.,New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York,1996

CO- PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

(A404603) SENSORS & TRANSDUCERS
(Open Elective-II)

	L	T	P	C
B.Tech-ECE	**3**	**0**	**0**	**3**

Unit – I: Introduction: Definition, principle of sensing & transduction, classification.
Mechanical and Electromechanical sensor: Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, Magnetostrictive type, material, construction and input output variable, Ferromagnetic plunger type, short analysis.

Unit – II: Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity, Proximity sensor. Stretched diaphragm type: microphone, response characteristics. Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

Unit – III: Thermal sensors: Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistor material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type. Radiation sensors: types, characteristics and comparison, Pyro electric type.

Unit – IV: Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. Geiger counters, Scintillation detectors.

Unit – V: Film Sensors: Thick film and thin film types, Electroanalytic sensors – Electrochemical cell, Polarization types, and membrane electrode types.
Biosensors, Smart/Intelligent sensors, Nano-sensors, Nano-tube sensors, molecular and quantum sensors.

TEXT BOOKS:
1. Sensor & transducers, D. Patranabis, 2nd edition, PHI
2. Instrument transducers, H.K.P. Neubert, Oxford University press.
3. Measurement systems: application & design, E.A.Doebelin, McGraw Hill.

REFERENCE BOOKS:
1. Sensor and Transducers, Third Edition, Ian Sinclair, Newnes.
2. Sensor Technology, Hand Book, JON S. Wilson, Newnes.ELSEVIER.
3. Sensor and Transducers, Characteristics, Applications, Instrumentation, Interfacing, Second Edition, M.J.Usher and D.A.Keating, MACMILLAN Press Ltd.

COURSE OUTCOMES:
At the end of the course the student will be able to:
1. Explain the basic concepts of mechanical and electromechanical sensors, their electrical characteristics.
2. Analyze various capacitor sensors, ultrasonic sensors their electrical characteristics.
3. Compare and elaborate various thermal sensors, principle of operation.
4. Distinguish various magnetic sensors based on their operations, radiation sensors and their operation.
5. Analyze various film sensors and operation of different nano sensors and their applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**										**1**
CO2	**3**	**2**										**1**
CO3	**3**	**2**										**1**
CO4	**3**	**2**										**1**
CO5	**3**	**2**										**1**

(A404604) IMAGE PROCESSING
(Open Elective-II)

B.Tech ECE

L	T	P	C
3	0	0	3

Unit- I: Digital Image Fundamentals
Digital Image fundamentals, Components of Digital Image Processing, Sampling andQuantization, Relationship between pixels.
Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform.

Unit-II: Image Enhancement (Spatial Domain)
Introduction, Image Enhancement in Spatial domain, Enhancement through point operation,Types of point operation, Histogram manipulation, Linear and nonlinear gray level Transformation, Local or neighborhood operation,Median filter, image Smoothing & Sharpening
Image Enhancement (Frequency Domain)
Filtering in Frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, image Smoothing&Sharpening.

Unit- III: Image Restoration
Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration.

Unit- IV: Image Segmentation
Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.
Morphological Image Processing: Dilation and Erosion, Structuring Element Decomposition, Opening and Closing, the Hit or Miss Transformation.

Unit- V: Image Compression
Redundancies and their removal methods, Fidelity criteria, Image compression models, Huffman and Arithmetic Coding, Error free compression, Lossy compression, Lossy and Lossless Predictive Coding, Transform based Compression, JPEG 2000 Standards.

Text Books:
1. Digital Image Processing – Rafael C. Gonzalez, Rechard E. Woods, 3rd edition. Pearson, 2008
2. Digital Image Processing – S. Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010

Reference Books:
1. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
2. Fundamentals of Digital Image Processing – A. K. Jain, PHI, 1989.
3. Digital Image processing and Computer vision – Somka, Hlavac, Boyle Cengage learning (Indian edition) 2008.
4. Introductory Computer vision Imaging Techniques and Solutions – Adrian low, 2008, 2nd Edition.
5. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC press, 2010.

Course outcomes
At the end of the course the student will be able to:
1. Describe the fundamentals of digital image processing.
2. Distinguish between spatial domain enhancement and frequency domain enhancement.
3.Explain various image degradation models for image restoration.
4. Analyze the image restoration and segmentation methods.
5. Discriminate between lossless and lossy compression techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										1
CO2	3	3										1
CO3	3	3	2									1
CO4	3	3	2									1
CO5	3	3	2									1

(A402603) ELECTRIC VEHICLE TECHNOLOGY
(OPEN ELECTIVE-I1 OFFERED BY EEE DEPT)

L	T	P	C
3	0	0	3

Prerequisites: Basics of Electrical Engineering (or equivalent subject)

Unit-I – Introduction to Hybrid Electric Vehicle:
Review of Conventional Vehicle: Introduction to Hybrid Electric Vehicles: Types of EVs, Hybrid Electric Drive-train, Tractive effort in normal driving

Unit-II – Electric Drives:
Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor

Unit- III– Energy Storage:
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles:- Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system, Design of Hybrid Electric Vehicle and Plug-in Electric Vehicle.

Unit-IV- Energy Management System:
Energy Management Strategies, Automotive networking and communication, EV charging standards, V2G, G2V, V2B, V2H. Business: E-mobility business, electrification challenges, Business- E-mobility business, electrification challenges.

Unit- V – Mobility and Connectors:
Connected Mobility and Autonomous Mobility- case study Emobility Indian Roadmap Perspective. Policy: EVs in infrastructure system, integration of Evs in smart grid, social dimensions of Evs. Connectors- Types of EV charging connector, North American EV Plug Standards, DC Fast Charge EV Plug Standards in North America, CCS (Combined Charging System), CHAdeMO, Tesla, European EV Plug Standards.

Text books

1. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003
2. Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.

Reference Books

1. Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2012
2. Tariq Muneer and Irene IllescasGarcía, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017
3. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer, 2013.

Course outcomes

On completion of the course, students will be able to

1. Explain Hybrid Electric Vehicle technology
2. Understand the operation of various Electric Drives used in Hybrid Electric Vehicle
3. Illustrate various energy storage techniques in Hybrid Electric Vehicle
4. Gain Knowledge on Energy Management Strategies in Hybrid Electric Vehicle
5. Understand the different types of Mobility and Connectors inHybrid Electric Vehicle

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

(A402604) BASICS OF POWER PLANT ENGINEERING
(OPEN ELECTIVE –II OFFERED BY EEE DEPT)

L	T	P	C
3	0	0	3

UNIT - I Coal Based Thermal Power Plants: Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems.

UNIT - II Gas Turbine and Combined Cycle Power Plants: Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

UNIT - III Basics of Nuclear Energy Conversion: Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

UNIT - IV Hydroelectric Power Plants: Classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems
UNIT - V Energy, Economic and Environmental Issues: Power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

TEXT BOOKS:
1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

REFERENCE BOOK:
1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

Course Outcomes
On completion of the course, students will be able to
1. Understand the layout of and various components of Coal Based Thermal Power Plants
2. Understand the operation of Gas Turbine and Combined Cycle Power Plants
3. Illustrate the Nuclear Energy Conversion system
4. Explain the operation and Classification, typical layout and components of Hydroelectric Power Plants
5. Understand the different parameters associated with Energy, Economic and Environmental Issues

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

(A405601) FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS
(OPEN ELECTIVE-II)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT-I
Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMS, The Three-Level ANSI-SPARC Architecture,
Database Languages, Data Models, Functions of a DBMS, Components of DBMS. Relational Model: Introduction, Terminology, Integrity Constraints, Views. The Relational Algebra: Unary Operations, Set Operations, Join Operations, Division Operation, Aggregation and Grouping Operations.

UNIT–II
SQL: The ISO SQL Data Types, Integrity Enhancement Feature–Domain Constraints, Entity Integrity, Referential Integrity, General Constraints, Data Definition–Creating a Database, creating a Table, changing a Table Definition, removing a Table, Creating an Index, Removing an Index, Views–Creating a View, Removing a View, View Resolution, Restrictions on Views, View Updatability 'WITH CHECK OPTION', Advantages and Disadvantages of Views, View Materialization.

UNIT–III
SQL: Introduction, Data Manipulation–Simple Queries, Sorting Results, Using the SQL Aggregate Functions, Grouping Results, Sub-queries, ANY and ALL, Multi-table Queries, EXISTS and NOT EXIST, Combining Result Tables, Database Updates.

UNIT-IV
Advanced SQL: The SQL Programming Language–Declarations, Assignments, Control Statements, Exceptions, Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers, Recursion.

UNIT–V
Normalization: The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, Functional Dependencies in brief, The Process of Normalization,1NF, 2NF, 3NF, BCNF.

Textbooks:
1.Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill Education, 2003
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill Education

Reference Books:
1.Thomas M. Connolly, Carolyn E. Begg, Database Systems–A Practical Approach to Design, Implementation, and Management (6e), Pearson publisher
2. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson publisher

Course Outcomes
Students shall be able to
1. Describe Database Management System Architecture.
2. Create, update, modify Relational Database Objects.
3. Manipulate data in Relational Database
4. Develop PL/SQL programs using Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers.
5. Explain the purpose of normalization and types Normal forms.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1										
CO2	2	2	2	2	2							
CO3	2	2	2	2	2							
CO4	2	2	2	2	2							
CO5	2	2	2	2	2							

(A405605) WEB PROGRAMMING
(OPEN ELECTEIVE-II)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

Unit-I

Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups Links and Navigation: Basic Links, Creating Links with the **< a>** Element, Advanced E- mail Links. Images, Audio, and Video: Adding Images Using the **<img>** Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages. Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables Forms: Introducing Forms, Form Controls, Sending Form Data to the Server Frames: Introducing Frameset, <frame>Element, Creating Links Between Frames, Setting a Default Target Frame Using **<base>**Element, Nested Framesets, Inline or Floating Frames with **<iframe>**. Changing font size, color of text using <font> Element, scrolling text/image using <marquee> Element

Unit-II

Cascading Style Sheets: Introducing CSS, where you can Add CSS Rules. **CSS Properties**: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model. **More Cascading Style Sheets:** Links, Lists, Tables, Outlines, the: focus and: activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout with CSS, **Page Layout**: Understating the Site's Audience, Page Size, Designing Pages, Coding your Design, Developing for Mobile Devices. **Design Issues:** Typography, Navigation, Tables, Forms.

Unit-III

Learning JavaScript: How to Add Script to Your Pages, the Document Object Model, Variables, Operators, Functions, Control Statements, Looping, Events, Built- In Objects, Working with JavaScript: Practical Tips for Writing Scripts, Form Validation, Form Enhancements, JavaScript Libraries. Putting Your site on the web: Meta tags, testing your site, Taking the Leap to Live, Telling the World about your site, Understanding your visitors.

Unit-IV

XML - Introduction, XML Basics, Structuring Data, XML Namespaces, Document Type Definitions (DTDs), W3C XML Schema Documents, XML Vocabularies, Extensible Style sheet Language and XSL Transformations, Document Object Model (DOM).

Unit-V

Ajax-Enabled Rich Internet Applications: introduction, history of Ajax, traditional web applications Vs Ajax Applications, RIAs with Ajax, Ajax example using XML HttpRequest object, XML and DOM, creating full scale Ajax-enabled application, Dojo Toolkit.

TEXTBOOK:

1. Jon Duckett, Beginning HTML, XTML, CSS and JavaScript
2. Dietel and Dietel : "Internet and World Wide Web - How to Program", 5th Edition, PHI/Pearson Education, 2011.

REFERENCE BOOKS:

1. Chris Bates, Web Programming
2. M. Srinivasan, Web Technology: Theory and Practice
3. Achyut S. Godbole, AtulKahate, Web Technologies
4. Kogent Learning Solutions Inc, Web Technologies Black Book
5. Ralph Moseley and M. T. Savaliya, Developing Web Applications

Course Outcomes

Students shall be able to

1. Write well-structured, easily maintained, standards-compliant, accessible HTML code.
2. write well-structured, easily maintained, standards-compliant CSS code to present HTML pages in different way
3. Use JavaScript to add dynamic content to pages.

4. Effectively debug JavaScript code, making use of good practice and debugging tools.
5. Use JavaScript to access and use web services for dynamic content (AJAX, JSON, etc.)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2	2	2							2
CO2		2	2	2	2							2
CO3		2	2	2	2				2			2
CO4		2	3	3	3				2	2		3
CO5		2	3	3	3				2	2		3

END

(A462602) Cloud Computing
(OPEN ELECTEIVE-II)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT - I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT - II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT - III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managingthe Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT - IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows Azure

TEXTBOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier,2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather,Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

COURSE OUTCOMES:

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Understanding cloud service providers.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A467802) LINUX PROGRAMMING
(OPEN ELECTEIVE-II)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

Unit I: Introduction to Linux Utilities

Linux utilities: A brief history of UNIX, architecture and features of UNIX, introduction to vi editor. General purpose utilities, handling utilities, security by file permissions, process utilities, disk utilities, Networking commands; Text processing and backup utilities: Text processing utilities and backup utilities;

SED: Scripts, operation, addresses, commands;

AWK:Execution,fieldsandrecords,scripts,operation,patterns,actions,associativearrays,string and mathematical functions, system commands in awk, applications.

Unit II: Working with The Bourn Again Shell (Bash)

Shell: Shell responsibilities, types of shell, pipes and i/o redirection, shell as a programming language, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, quoting, test command, control structures, arithmetic inshell, interrupt processing, functions, and debugging scripts;

Unit III: Handle Files and Directories

File structure and directories: Introduction to filesystem, file descriptors, file types, file system structure; File metadata: I nodes; System calls for file I/O operations: open, create, read, write, close, lseek, dup2, file status information-stat family;

File and record locking: fcntl function, file permissions, files ownership, links; Directories: Creating, removing and changing directories, obtaining current working directory, directory contents, scanning directories.

Unit IV: Process and Signals

Process: Process identifiers, process structure: process table, viewing processes, system processes, process scheduling; Starting new processes: Waiting for a process, process termination, zombie processes, orphan process, system call interface for process management, fork, vfork, exit,wait,waitpid, exec.

Signals: Signal functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets.

Unit V: Inter Process Communication

Inter process communication: Pipes, Semaphores, Shared Memory, and Message Queues.

Textbooks

1. W.Richard,Stevens,AdvancedProgrammingintheUNIXEnvironment,PearsonEducation,1Edition,2005
2. SumitabhaDas,Unix Concepts and Applications,TataMcGraw-Hill,4th Edition,2006.
3. NeilMathew, RichardStones, Beginning Linux Programming, Wrox,WileyIndia,4th Edition,2011.

Reference Textbooks

1. SumitabhaDas,YourUnixtheUltimateGuide,TataMcGraw-Hill,4th Edition,2007.
2. W. R. Stevens, S. A. Rago, Advanced Programming in the Unix Environment Pearson Education, 2nd Edition,2009
3. B. A. Forouzan,R. F. Gilberg,Unix andShellProgramming,CengageLearning,3rd Edition,2005.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

(A466602) FOUNDATIONS OF MACHINE LEARNING
(OPEN ELECTEIVE-II)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

Unit 1: Introduction
What Is Machine Learning? How Do We Define Learning?, How Do We Evaluate Our Networks?, How Do We Learn Our Network?, What are datasets and how to handle them?, Feature sets, Dataset division: test, train and validation sets, cross validation.

Unit 2: Basics of machine learning
Applications of Machine Learning, processes involved in Machine Learning, Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning.

Unit 3: Supervised learning
Classification and Regression: K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve.

Unit 4: Unsupervised learning
Introduction to clustering, Types of Clustering: Hierarchical, Agglomerative Clustering and Divisive clustering; Partitional Clustering - K-means clustering.

Unit 5: Miscellaneous
Dimensionality reduction techniques: PCA, LDA, ICA. Introduction to Deep Learning, Gaussian Mixture Models, Natural Language Processing, Computer Vision.

Textbooks:
1. Introduction to Machine Learning, By Jeeva Jose, Khanna Book Publishing Co., 2020.
2. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies, 2016.
3. Machine Learning, By Rajeev Chopra, Khanna Book Publishing Co., 2021.
4. Machine Learning: The New AI, By EthemAlpaydin, The MIT Press, 2016.

Reference Books
1. Machine Learning, Tom M. Mitchell, McGraw Hill Education, 2017.
2. https://www.udacity.com/course/intro-to-machine-learning--ud120
3. https://www.coursera.org/learn/machine-learning-duke

Course Outcomes:
After completion of course, students would be able to:
1. Understand basic applications and issues of Machine Learning
2. Understand the different types of datasets
3. Analyze and work with different datasets
4. Analyze various Machine Learning techniques and algorithms
5. Apply various algorithms to different datasets.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**3**	2									**2**
CO2	**3**	**2**	3	3	3							**2**
CO3	**3**	**3**	3		3			2				**2**
CO4	**3**	**3**	3		3			2				**2**
CO5	**3**	**3**	3					2				**2**

END

(A403603) FUNDAMENTALS OF MANUFACTURING PROCESSES
(Open Elective: Offered by Mechanical Engineering Department)

B. Tech

L	T	P	C
3	0	0	3

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding - TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

UNIT – V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects –cold forging, swaging, Forces in forging operations.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao / Mc Graw Hill
2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson.

REFERENCE BOOKS:

1. Metal Casting / T.V Ramana Rao / New Age
2. Métal Fabrication Technology/ Mukherjee/PHI

Course Outcomes:

For given product, one should be able identify the manufacturing process.

1. Understand the idea for selecting materials for patterns.
2. Learn different types and allowances of patterns used in casting and analyze the components of moulds.
3. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes.
4. Develop process-maps for metal forming processes using plasticity principles.
5. Identify the effect of process variables to manufacture defect free products.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	1					1	1
CO2	2	2	2	2			1				1	1
CO3	2	2	2	2			1				1	1
CO4	2	2	2	2			1				1	1
CO5	3	3	3	2	2	2					1	1

(A403604) FUNDAMENTALS OF AUTOMOBILE ENGINEERING
(Open Elective: Offered by Mechanical Engineering Department)

B. Tech

L	T	P	C
3	0	0	3

Unit – I

Introduction: Components of four-wheeler automobile – chassis and body – power unit – power transmission rear wheel drive, front wheel drive, 4-wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, re boring, decarburization

Unit – II

Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps – Carburetor – types – air filters – petrol injection.
C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel, pumps.
Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

Unit – III

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.
Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Unit – IV

Transmission System: Clutches, principle, types- cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter.
Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.
Steering System: Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism

Unit-V Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.
Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

TEXT BOOKS

1. Automobile Engineering, Vol. 1 & Vol. 2/ Kripal Singh
2.Automobile Engineering, Vol. 1 & Vol. 2 ,by K.M Gupta,Umesh publication

REFERENCE BOOKS

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing Pvt Ltd.
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner
4. Alternative fuels of Automobiles by P. Rami Reddy, Frontline publications.

Course outcomes:

By undergoing this course, a student shall be able to
1. Identify power generation, transmission and control mechanisms in an automobile
2. Manipulate the chemical, thermal, mechanical and electrical energies in an automobile
3. Infer the interaction between subsystems
4. Analyze how transmission system works
5. Learn different components of suspension systems.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1	1	1	3	3					3
CO2	3		1	1	1	3	3					3
CO3	3		3	2	1	3	3					3
CO4	3		3	2	1	3	3					3
CO5	3		1	1	1	3	3					3

****END****

A400603 – ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

Unit I:

Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- The evolution of entrepreneurship- Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.

Unit II:

The individual entrepreneurial mind-set and Personality- The entrepreneurial journey- Stressand the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations. Corporate Entrepreneurial Mindset- the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

Unit III:

Launching Entrepreneurial Ventures- opportunities identification- entrepreneurial Imagination and Creativity- the nature of the creativity process-Innovation and entrepreneurship. Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising-hybrid- disadvantage of Franchising.

Unit IV:

Legal challenges of Entrepreneurship-Intellectual property protection-Patents, Copyrights-Trade marks and Trade secrets-Avoiding trademark pitfalls. Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, Poor financial Understanding-Critical factors for new venture development-The Evaluation process-Feasibility criteria approach.

Unit V:

Strategic perspectives in entrepreneurship- Strategic planning-Strategic actions- strategic positioning-Business stabilization- Building the adaptive firms-Understanding the growth stage- Unique managerial concern of growing ventures.

Text Books:

1. D F Kuratko and T V Rao "Entrepreneurship- A South-Asian Perspective "Cengage Learning, 1st edition, 2012. **(For PPT, Case Solutions Faculty may visit : login.cengage.com)**
2. Vasant Desai "Small Scale industries and entrepreneurship" Himalaya publishing, 9th Edition, 2017.
3. Rajeev Roy "Entrepreneurship" 3e, Oxford, 2020.
4. B.Janakiram and M.Rizwana" Entrepreneurship Development :Text & Cases, ExcelBooks, 1st Edition, 2011.
5. Stuart Read, Effectual Entrepreneurship, Routledge, 2nd Edition, 2016.
6. Robert Hisrich et al "Entrepreneurship" 6th e, TMH, 2012.

Course Outcomes

1. Identify the evolution and approaches of Entrepreneurship.
2. Analyze and develop the conceptualization of corporate Entrepreneurship Personality.
3. Explore different possibilities to start an Enterprise for young Entrepreneurs.
4. Outline challenging benchmarks for formulation of Entrepreneurship.
5. Evaluate the application of Strategic action for growing ventures.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

A400604 - ETHICS IN BUSINESS & CORPORATE GOVERNANCE

L	T	P	C
3	0	0	3

Unit – I: Business Ethics in the Changing Environment: Business Ethics, Levels of Business Ethics, Myths about Business Ethics, Stages of Moral Development Kohlberg's Study, Carol Gilligan's Theory, Principles of Ethics.

Unit – II: Professional Ethics: Introduction to Professional Ethics, Ethics in Production and Product Management, Ethics of Marketing Professionals, Ethics in HRM, Ethics of Finance and Accounting Professionals, Ethics of Advertisement, Ethics of Media Reporting, Ethics of Healthcare Services. Ethical Dilemma, Mounting Scandals, Ethical Issues, Preparatory Ethics: Proactive Steps, Cyber Ethics.

Unit – III: Corporate Governance: Introduction to Corporate Governance, Major Corporate Governance Failures, Need for Corporate Governance, Corporate Governance in India, Theories of Corporate Governance: Agency Theory, Stewardship Theory and Stakeholder Theory, Problems of Governance in Companies, Role of Capital Markets, Regulator, Government in Corporate Governance.

Corporate Governance Codes and Committees: Global Reporting Initiative, OECD Principles, Cadbury Committee Report, Kumara Mangalam Birla Committee Report, Naresh Chandra Committee Report, Narayana Murthy Committee Report, SEBI Clause 49 Guidelines, Corporate Governance Committees.

Unit – IV: Role of Board: Types of Directors Functions of the Board, Structure of the Board, Role of the Board in Subcommittees, Audit, Compensation Committee, Role, Duties and Responsibilities of Directors, Conflicts of Interest, Remedial Actions. Governance Ratings, Merits and Demerits of Governance Ratings.

Unit – V: Corporate Social Responsibility (CSR): Models for Implementation of CSR, Scope of CSR, Steps to attain CSR, Business Council for Sustainable Development (BCSD) India, Ethics and Social Responsibility of Business, Social Responsibility and Indian Corporations, CSR as a Business Strategy for Sustainable Development,CSR Committee,Recent Amendments in Companies Act (Sec:135).

Reference Books

1. Jyotsna G B, R C Joshi, Business Ethics and Corporate Governance, TMH, 1e, 2019.
2. Martin J. Ossewaarde, Introduction to Sustainable Development, sage,1e,2018.
3. T.N. Sateesh Kumar, Corporate Governance, Oxford University Press, 2015.
4. SK Mandal, Ethics in Business and Corporate Governance, TMH, 2/e,2017.
5. Archie. B Carroll, Business Ethics-Brief Readings on Vital Topics, Routledge, 2013.
6. A.C. Fernando, Corporate Governance: Principles, Policies and Practices, 2nd Edition,Pearson,2018.
7. C.S.V. Murthy, Business Ethics, 1st Edition, Himalaya Publishing House,2019.
8. N. Balasubramanian, Corporate Governance and Stewardship,TMH,2012.
9. Nina Godbole &SunitBelapure, Cyber Security, wileyindia, 2012.
10. Joseph W.Weiss, Business Ethics, Thomson,2006.
11. Geethika, RK Mishra, Corporate Governance Theory andPractice,Excel,2013.
12. Dr.S.S. Khanka, Business Ethics and Corporate Governance, S.Chand,2013.

13. Praveen Parboteeach, Business Ethics, Routledge,2019.
14. Praveen B Malla, Corporate Governance, Routledge2016.

Course Outcomes: Students will be able to

1. Understand the Need for Business Ethics and Corporate Governance in India.
2. Apply Knowledge of Established Methodologies of Solving Professional Ethical Issues.
3. Learn Codes and Committees in Corporate Governance.
4. Understand the Role of Board in Corporate Governance.
5. Assess the Stakeholder perspective of Corporate Governance.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A401603) REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEMS
(Open Elective-II)

B.Tech VII –Semester

L	T	P	C
3	0	0	3

UNIT - I:

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II

EIA Methodologies: Environmental attributes -Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief&
Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co.,New York, 1991.

2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York,1996

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A401604)-SOLID WASTE MANAGEMENT
(Open Elective-II)

B.Tech (CE) VII –Semester

L	T	P	C
3	0	0	3

UNIT - I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT - II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems – Route planning - transfer and transport; processing techniques.

UNIT- III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing - recovery of thermal conversion products; Pyrolisis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

UNIT- IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life of landfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT- V

Hazardous waste Management: – Sources and characteristics, Effects on environment, Risk assessment – Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

TEXT BOOKS:

1. Tchobanoglous G, Theisen H and Vigil SA ‘Integrated Solid Waste Management, EngineeringPrinciples and Management Issues’ McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, ‘Solid Waste Engineering’ Brooks/Cole Thomson LearningInc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, ‘Environmental Engineering’, McGraw Hill Inc.,New York, 1985.
2. Qian X, Koerner RM and Gray DH, ‘Geotechnical Aspects of Landfill Design and Construction’Prentice Hall, 2002.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A404605) FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective-III)

B.Tech

L	T	P	C
3	0	0	3

Unit- I: Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems

Unit- II: Typical Embedded System
Core of the Embedded System: General Purpose and Domain Specific Processors, Memory, ROM, RAM, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: On-board and External Communication Interfaces.

Unit –III: Embedded Firmware
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit – IV: RTOS Based Embedded System Design
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit – V: Task Communication
Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization issues, Task Synchronization Techniques, Device Drivers

Text Book:
1. Introduction to Embedded Systems – Shibu K.V. McGraw Hill
2. Embedded Systems – Raj Kamal, TMH

Reference Books:
1. Embedded System Design – Frank Vahid, Tony Givargis, John Wiley.
2. Embedded Systems – Lyla, Pearson, 2013
3. An Embedded Software Primer- David E Simon, Pearson Education

Course outcomes:
At the end of the course the student will be able to:
1. Explain the basics of embedded systems and classify its applications
2. Compare various types of memories, sensors and Input / Output devices.
3. Summerize the embedded firmware for various applications.
4. Interpret the characteristics of Real time operating Systems
5. Illustrate the concepts of shared memory and task communications

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3	1	1									
CO3	2											1
CO4	2	1	1	1								
CO5	3				1							

(A404606) DATA COMMUNICATIONS
(Open Elective-III)

B.Tech.

L	T	P	C
3	0	0	3

Unit I: Introduction to data communications, networking, signals, noise, modulation and demodulation. Data communication network architecture, layered network architecture, open systems interconnection, data communications circuits, serial and parallel data transmission, data communications circuit arrangements, data communication networks, alternate protocol suites. Information capacity, bits, bit rate, baud, and M-ARY encoding.

Unit II: Metallic cable transmission media & optical fiber transmission media: metallic transmission lines, transverse electromagnetic waves, characteristics of electromagnetic waves, transmission line classifications, metallic transmission line types, metallic transmission line equivalent circuit, wave propagation on metallic transmission lines, metallic transmission line losses, block diagram of an optical fiber communications system, optical fiber versus metallic cable facilities.

Unit III: Digital transmission & multiplexing and t-carriers digital transmission: pulse modulation, pulse code modulation, dynamic range, signal–to-quantization noise voltage Ratio, linear versus nonlinear PCM codes
Multiplexing: Time- division multiplexing, t1 digital carrier system, north American digital multiplexing hierarchy, digital line encoding, t carrier systems, European digital carrier system, statistical time – division multiplexing, frame synchronization, frequency- division multiplexing, wavelength- division multiplexing, synchronous optical network

Unit IV: Telephone instruments and signals: The subscriber loop, standard telephone set, basic telephone call procedures, call progress tones and signals, cordless telephones, caller id, electronic telephones, paging systems.
The telephone circuit: The local subscriber loop, telephone message- channel noise and noise weighting, units of powers measurement, transmission parameters and private-line circuits, voice-frequency circuit arrangements, crosstalk.

Unit V: Data communication codes, bar codes, error control, error detection, error correction, data formats, data communications hardware, character synchronization.

Text Books:
1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.

Reference Books:
1.Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.Tmh.
2. Computer Communications and Networking Technologies, Gallow, Secondedition Thomson
3. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education

Course Outcomes:
At the end of the course, the student will be able to:
1. Explain the basic concepts of data communication systems.
2. Distinguish various types of transmission medias for data communications.
3. Compare different multiplexing techniques for digital transmission
4. Analyze different telephone instruments, signal and circuits
5. Identify different error detecting and correcting codes.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									2
CO2	3	3	2									2
CO3	3	3	2									2
CO4	3	3	2									2
CO5	3	3	2									2

(A402605)NANO TECHNOLOGY
(OPEN ELECTIVE-IIIOFFERED BY EEE DEPT)

B. Tech

L	T	P	C
3	0	0	3

UNIT I: NTRODUCTION
History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT II: UNIQUE PROPERTIES OF NANOMATERIALS
Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nano crystalline alloy, Permanent magnetic nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT III: SYNTHESIS ROUTES
Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self-assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing, Spark plasma sintering.

UNIT IV: TOOLS TO CHARACTERIZE NANO MATERIALS
X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT V: APPLICATIONS OF NANOMATERIALS
Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, WaterTreatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Défense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, McGraw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press

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

1. Classify nanostructured materials
2. Illustrate the characteristics and properties of nano-materials.
3. Identify the synthesis routes of nano-materials
4. Make use of the tools to characterize the nano-materials.

5. Utilize the nano-materials for various applications

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A402604)EV BATTERIES & CHARGING SYSTEM
(OPEN ELECTIVE-III OFFERED BY EEE DEPT)

L	T	P	C
3	0	0	3

B. Tech

Prerequisites: Basics of Electrical Engineering (or equivalent subject)

UNIT I - Battery parameters:
Cell and battery voltages, Charge (or Amphour) capacity, Energy stored, Energy density, Specific power, Amphour (or charge) efficiency, Energy efficiency, Self-discharge rates, Battery geometry, Battery temperature, heating and cooling needs, Battery life and number of deep cycles

UNIT II – EV Batteries:
Lead Acid Batteries Lead acid battery basics, Special characteristics of lead acid batteries, Battery life and maintenance, Battery charging, Summary Nickel-based Batteries Introduction, Nickel cadmium, Nickel metal hydride batteries

UNIT III– Sodium, Lithium and Metal air batteries:
Sodium-based Batteries Introduction, Sodium sulphur batteries, Sodium metal chloride (Zebra) batteries Lithium Batteries Introduction, The lithium polymer battery, The lithium ion battery Metal Air Batteries Introduction, The aluminium air battery, The zinc air battery

UNIT IV– Charging Infrastructure:
Domestic Charging Infrastructure, Public Charging Infrastructure, Normal Charging Station, Occasional Charging Station, Fast Charging Station, Battery Swapping Station, Move-and-charge zone.

UNIT V– EV Charging Battery Chargers:
Charge equalisation, Conductive (Basic charger circuits, Microprocessor based charger circuit. Arrangement of an off-board conductive charger, Standard power levels of conductive chargers, Inductive (Principle of inductive charging, Soft-switching power converter for inductive charging), Battery indication methods

Text books

1. James Larminie Oxford Brookes University, Oxford, UK John Lowry Acenti Designs Ltd., UK, Electric Vehicle Technology Explained
2. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.

Reference Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
2. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Course Outcomes

On completion of the course, students will be able to

1. Gain knowledge on various battery parameters
2. Classify different types of EV batteries
3. Illustrate Sodium, Lithium and Metal air batteries
4. Understand the different types of Charging Infrastructure.
5. Understand the operation of EV Charging Battery Chargers

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A405603) FUNDAMENTALS OFCOMPUTER NETWORKS
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT-I
Fundamental of Data Communication and Computer Network: Components, Data Representation, Data Flow, Data and Signal, Classification Network: LAN, WAN, MAN, **Network Architecture:** Peer to Peer, Client Server Network, History of Internet.

UNIT-II
Network Model: OSI Reference Model and TCP/IP Protocol Suit
Network Connecting Devices: Hub, Switch, Router, Repeater, Bridge, Gateway, Modem
Network Topologies: Types of Topology-Bus, Ring, Star, Mesh, Tree, Hybrid, and IEEE Standards.

UNIT-III
Physical Layer: Guided Transmission Media and Unguided Transmission Media
Data Link Layer: Design Issues, Error Detection and Correction, Simplex Stop and wait protocol.

UNIT-IV
Network Layer: Design Issues, Routing Algorithm: Shortest Path Routing algorithm, Congestion Control, IPv4, IPv6, DHCP
Transport Layer: Process to process Delivery, Addressing, UDP and TCP, Error control and flow control.

UNIT-V
Application Layer: Domain Name System, E-Mail, FTP, WWW and Http.
Network Security: Cryptography, Symmetric Key and Public Key, Firewall, VPN, Web Security

Textbooks:
1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition.Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

Reference Books:
1. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
2. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson
3. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016.

Course Outcomes:
1 Explain the Data in communication and two types of networks architecture.
2 Compare OSI Reference model and TCP/IP Protocol Suit and able to Sketch the different topologies and network connecting devices.
3 Describe about Transmission media in Physical layer and Analyze the Error detection and correction methods in Data link layer.
4 Apply knowledge in developing routing algorithm and Explain transport layer protocols.
5 Examine the Application layer Protocols and Analyze various network security approaches.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		2								
CO2	2	2		2								
CO3	2	2		2								
CO4	2	2	2	2								
CO5	2	2	2	2								

****END****

(A405606) DEVOPS
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT - I
Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II
Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.
DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT - III
Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV
Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT - V
Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven developmentDeployment of the system: Deployment systems, Virtualization stacks, code execution at the client,
Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXTBOOKS:
1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:
1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10

Course Outcomes:
On successful completion of this course, students will be able to:
1. Identify components of Devops environment
2. Describe Software development models and architectures of DevOps
3. Apply different project management, integration, testing and code deployment tool
4. Investigate different DevOps Software development models
5. Assess various Devops practices, Collaborate and adopt Devops in real-time projects

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					2							2
CO2		3										2
CO3			3	3							2	2
CO4			3	3					1	1	2	2
CO5				3					2	1	2	2

(A462602) CYBER LAWS AND ETHICS
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT-I

Evolution of the IT Act: Genesis and Necessity

Salient features of the IT Act, 2000,2008 various authorities under IT Act and their powers. ; Penalties &Offences, amendments.

UNIT-II

Impact on other related Acts (Amendments): (a) Amendments to Indian Penal Code.(b) Amendmentsto Indian Evidence Act.(c) Amendments to Bankers Book Evidence Act.(d) Amendments to Reserve Bank of India Act.

Cyber Space Jurisdiction: (a) Jurisdiction issues under IT Act, 2000, 2008
(b) Traditional principals of Jurisdiction,
(c) Extra-terrestrial Jurisdiction,
(d) Case Laws on Cyber Space Jurisdiction

UNIT-III

E – commerce and Laws in India:(a) Digital / Electronic Signature in Indian Laws, (b) E – Commerce; Issues and provisions in Indian Law, (c) E – Governance; concept and practicality in India ,(d) E – Taxation issues in Cyberspace ,(e) E – Contracts and its validity in India ,(f) Cyber Tribunal & AppellateTribunal, (g) Cyber Regulations

UNIT-IV

Sensitive Personal Data or Information (SPDI) in Cyber Law: (a) SPDI Definition and Reasonable Security Practices in India, (b) Reasonable Security Practices – International perspective

UNIT-V

Cloud Computing & Law : International Perspective, (a) EDI: Concept and legal Issues. (b) UNCITRAL Model Law. (c) Electronic Signature Law's of Major Countries, (d) Cryptography Laws, (e)Cyber Law's of Major Countries ,(f) EU Convention on Cyber Crime

TEXTBOOKS:

1. Cyber Law & Cyber Crimes By Advocat Prashant Mali; Snow White publications, Mumbai
2. Cyber Law in India by Farooq Ahmad; Pioneer Books

REFERENCE BOOKS:

1. Information Technology Law and Practice by Vakul Sharma; Universal Law Publishing Co. Pvt. Ltd.
2. The Indian Cyber Law by Suresh T. Vishwanathan; Bharat Law House New Delhi.

Course Outcomes:

1. To understand about IT Act.
2. To know about cyber space Jurisdiction
3. To know about E- Commerce and laws
4. To Understand Intellectual property rights.
5. To know about cyber laws.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A467803) BUSINESS INTELLIGENCE
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT – I

Business Intelligence: Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT - II

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-event-Driven alerts - A cyclic process of Intelligence Creation. The value of Business Intelligence-Value driven & Information use.

UNIT - III

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of differentBI-Tools (Pentaho, KNIME)

UNIT - IV

Business Intelligence Implementation-Business Intelligence and integration implementation-connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

UNIT –V

Building the BI Project- Planning the BI Project, Project Resources, Project Tasks, Risk Management and Mitigation, Cost justifying BI solutions and measuring success.
Creating User Requirements, Requirements-Gathering Techniques; Prioritizing & Validating BI Requirements, Changing Requirements; BI Design and Development; Best practices for BI Design; Post Implementation- Evaluation; Maintaining your BI Environment.

TEXTBOOKS:

1. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.
2. Business Intelligence (IBM ICE Publication)

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard withEmerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQLServer, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)].

Course Outcomes:

1. Understand Fundamental concepts of BI and Analytics
2. Application of BI Key Performance indicators
3. Design of Dashboards, Implementation of Web Analytics
4. Understand Utilization of Advanced BI Tools and their Implementation.
5. Implementation of BI Techniques and BI Ethics.
6. Build Business Projects

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

****END****

(A466603) ARTIFICIAL NEURAL NETWORKS
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech	**3**	**0**	**0**	**3**

UNIT - I
Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT - II

Single Layer Perceptron: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron – Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT - III
Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT - IV
Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT – V
Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models, Computer Experiment

TEXTBOOKS:
1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCE BOOKS:
1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural Networks in Computer Inteligance, Li Min Fu MC GRAW HILL EDUCATION 2003
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

Course Outcomes: By completing this course the student will be able to:
1. Understand the similarity of Biological networks and Neural networks
2. Perform the training of neural networks using various learning rules.
3. Understanding the concepts of forward and backward propagations.
4. Design and develop applications using neural networks.
5. Understand and Construct the Hopfield models.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	**2**	**3**	**2**									
CO2	**2**	**3**	**2**	**3**	**3**							**2**
CO3	**2**	**3**	**2**		**3**							**2**
CO4	**2**	**3**	**2**		**3**							**2**
CO5	**2**	**3**	**2**									**2**

(A403605) INDUSTRIAL SAFETY ENGINEERING
(Open Elective: Offered by Mechanical Engineering Department)

B. Tech

L	T	P	C
3	0	0	3

UNIT-I:
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II:
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III:
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV:
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V:
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TEXT BOOKS
1. Mobley, R. Keith, Lindley R. Higgins, and Darrin J. Wikoff. *Maintenance Engineering Handbook*. New York, NY: Mcgraw-Hill, 2008.
2. Garg, H. P. *Industrial Maintenance*. S Chand, 1976.

REFERENCE BOOKS:
1. Graham, F. D. "Audels Pumps, Hydraulics and Air Compressors. Theo." (1998).
2. Winterkorn, Hans F., and Hsai-Yang Fang. *Foundation engineering handbook*. Springer, Boston, MA, 1991.

Course Outcomes:
At the end of the course, the student should be able to
1. Understand various hazards and their prevention.
2. Apply maintenance techniques to various equipments.
3. Understand types of wear and corrosions and their prevention.
4. Explain fault tracing and its applications.
5. Apply periodic and preventive maintenance techniques to various equipments.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	3	3	3	1				1		3	3
CO2	3	3	3	3	1				1		3	3
CO3	3	3	3	3	1				1		3	3
CO4	3	3	3	3	1				1		3	3
CO5	3	3	3	3	1				1		3	3

END

(A403606) WASTE TO ENERGY
(Open Elective: Offered by Mechanical Engineering Department)

B. Tech

L	T	P	C
3	0	0	3

Unit-I:
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II:
Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III:
Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV:
Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V:
Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

REFERENCE BOOKS:

1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons,1996.

Course Outcomes:
By undergoing this course, a student shall be able to

1. Understand different Conversion Devices.
2. Explain Biomass Pyrolysis.
3. Understand the working Principle of biomass gasification
4. Explain Biomass Combustion.
5. Know the application of Bio Gas.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	2	3	3	3	2	1	2		2			2
CO2	3	2	2	3	3	1	2		2			2
CO3	3	3	1	3	1	1	2		2			2
CO4	3	3	1	3	1	1	2		2			2
CO5	3	2	1	3	2	1	2		1			2

END

A400605 - BASICS OF MARKETING

L	T	P	C
3	0	0	3

Unit I

Understanding Marketing Management: Concepts of Marketing, Marketing Strategies & Plans, Creating long term Loyalty relationships, Marketing mix, Product Life Cycle.

Unit II

Connecting with Customers & Building Strong Brands: Analyzing Competitors, Conducting Marketing Research, Consumer Behaviour, Identifying market segments and targets, crafting Brand Positioning.

Unit III

New Product and Promotions: Introducing New Market Offering, Developing Pricing Strategies & Programmes, Designing & Managing Integrated Marketing Communications, Advertising & Sales Promotions, Managing Digital Communication – Online, Social Media & Mobile, Personal Selling.

Unit IV

Delivering Value: Managing Retailing, Wholesaling and logistics, Designing and Managing Integrated Marketing Channels.

Unit V

Sales Management: Nature and Importance of Sales Management, Skills of Sales Manager, Sales objectives, Concepts of Sales organization, Type of Sales organization.

Text books:

1. Marketing Management, Philip Kotler, Kevin Lane Keller, Pearson

References:

1. Rosalind Masterson, Nichola Philips, David Pickton, Marketing : An Introduction, 5e, Sage Publications, 2021.
2. G. Shainesh Philip Kotler, Kevin Lane Keller, Alexander Cherneb, Jagdish N Sheth, Marketing Management, 16e, Pearson, 2022.
3. Lamb, Hair, Sharma, Mc Daniel: MKTG, A South Asian Perspective, Cengage Learning, 2016. (For PPT, Case Solutions, video cases, Faculty may visit : login.cengage.com)
4. Philip Kotler, Gray Armstrong, Principles of Marketing, Pearson Education, 18e,2020.
5. Ramaswamy, Namakumari, Marketing Management, Sage Publications, 6e, 2018.
6. Lamb, Hair, Sharma, Mc Daniel, Principles of Marketing:A South Asian Perspective,Cengage Learning, 2016.
7. Paul Baines, Chris Fill, Kelly Page, Piyush Sinha, Marketing, Asian Edition, OxfordUniversity Press, 2015.
8. Arun Kumar & N. Meenakshi, Marketing Management , Vikas, 3e, 2016
9. RajanSaxena, Marketing Management, Tata Mc Graw Hill,3e, 2012.

10. Kenneth E Clow, Donald Baack, Cases in Marketing Management, Sage South Asiaedition,2015.
11. Rajendra P Maheshwari, marketing management text and cases, an Indian perspective,International Book House2012.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Analyze the scope, concepts of Marketing and forecasting techniques in presentGlobal Market Environment.
2. Outline marketing research, consumer behaviour, segmentation and targeting.
3. Develop conceptual knowledge on new product development, marketing mix andpromotional mix
4. Illustrate marketing channels of distribution and logistics
5. Identify the skills and importance of sales management.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1		**3**	**3**		**2**	**3**				**3**		
CO2					**3**	**3**		**3**			**2**	
CO3						**3**	**2**		**3**		**3**	
CO4			**3**						**3**		**2**	
CO5	**3**						**3**			**3**		

END

(A400606) - INTELLECTUAL PROPERTY RIGHTS

L	T	P	C
3	0	0	3

UNIT-I: INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international Organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II: TRADE MARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, Selecting and evaluating trade mark, trade mark registration processes.

UNIT-III: LAW OF COPY RIGHTS: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right owner ship issues, copy right registration, notice of copy right , international copy right law.

Law of Patents: Foundation of patent law, patent searching process, owner rights and transfer.

UNIT-IV: TRADE SECRETS: Trade secret law, determination of trade secrete status' liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

UNFAIR COMPETITION: Misappropriation right of publicity, false advertising

UNIT-V: NEW DEVELOPMENT OF INTELLECTUAL PROPERTY: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international-trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES

- Intellectual property right, Deborah, E. Bouchoux, cengage learning, 5E, 2017.
- Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, TataMc Graw Hill Publishing Company Ltd, 1E, 2017.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Skill to understand the concept of intellectual property rights.
2. Gain knowledge on development and owning of Trade Marks, Copy Rights, and Patents.
3. Develops procedural knowledge to Legal System and solving the problem relating Patents.
4. Develops conceptual exposure on trade secrets.
5. Knowledge on new development of intellectual property.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1								2				3
CO2						3	2	2				2
CO3								2				3
CO4						3	2	2				2
CO5		3	3	2							3	

(A401605) ENERGY EFFICIENT BUILDINGS
(Open Elective-III)

B.Tech (CE) VIII -Semeste

L	T	P	C
3	0	0	3

Unit I

Climates and buildings, Thermal properties and energy content of building materials, Psychrometry, thermal comfort: Criteria and various parameters, Air conditioning systems, Energy conservation techniques in Air conditioning systems. Climate and comfort zones, Introduction to the design of shadingdevices, Overhangs. Factors that effects energy use in buildings: ventilation and its significance.

Unit II

Passive and active methods of heating and cooling, Passive heating concepts: direct heat gain, indirect heat gain, isolated gain and sunspaces. Passive cooling concepts: evaporative cooling, radiative cooling; application of wind, water and earth for cooling; shading, paints and cavity walls for cooling; roof radiation traps; earth air-tunnel.

Unit III

Heat transmission in buildings: surface co-efficient: air cavity, Internal and external surfaces Overall thermal transmittance, Wall and windows; Heat transfer due to ventilation/infiltration, Internal heattransfer; Decrement factor; Phase lag; Lighting (Daylighting and Electric lighting), Design of day-lighting, Concept of sol-air temperature and its significance.

Unit IV

Estimation of building loads, Steady state method, Network method, Numerical method, Correlations. Energy conservation through site selection, Planning and design; Siting and orientation Green buildings,Zero emission buildings. Energy Efficient Landscape Design: Modification of microclimatic throughlandscape element for energy conservation.

Unit V

Bioclimatic classification of India; Passive concepts appropriate for the various climatic zones in India; Typical design of selected buildings in various climatic zones; Thumb rules for design of buildings and building codes Energy Efficient Landscape Design: Modification of microclimatic through landscape element for energy conservation

TEXT BOOKS:

1. Tiwari G N, Goyal R K, Greenhouse Technology: Fundamentals, Design Modelingand Application, Narosa Publishing House.
2. Krieder J, Rabi A, Heating and Cooling of Buildings: Design for Efficiency, McGrawHill.

REFERENCE BOOKS:

1. Archie, Culp W, Principles of Energy Conservation, McGraw Hill.
2. Callaghan P O, Energy Management, McGraw - Hill Book Company.
3. Williams J R, Passive Solar Heating, Ann Arbar Science.
4. Majumder Milli, Energy Efficient Buildings, TERI, New Delhi.

Course Outcome:

1. Identify different Energy conservation techniques in Air conditioning systems
2. Demonstrate a good ability to calculate the energy balance of buildings

3. Assess whether there is a potential conflict between energy conservation and indoor climate for different energy saving measures
4. Evaluate different opportunities to save energy with measures regarding both building technology and building services engineering
5. able to design different buildings in various climatic zones

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	3		2	3	3			3	2		3
CO2	3	3		2	3	3			3	2		3
CO3	3	3		2	3	3			3	2		3
CO4	3	3		2	3	3			3	2		3
CO5	3	3		2	3	3			3	2		3

****END****

(A401606) ENVIRONMENTAL POLLUTION
(Open Elective-III)

B.Tech (CE) VIII -Semester

L	T	P	C
3	0	0	3

UNIT - I

Air Pollution: Air pollution Control Methods – Particulate control devices – Methods of Controlling Gaseous Emissions–Air quality standards. Noise Pollution: Noise standards, Measurement and control methods –Reducing residential and industrial noise –ISO: 14000.

UNIT - II

Industrial waste water Management: Strategies for pollution control –Volume and Strength reduction –Neutralization –Equalization – Proportioning –Common Effluent Treatment Plants – Recirculation of industrial wastes –Effluent standards.

UNIT - III

Solid Waste Management: Solid Waste Management: solid waste characteristics –basics of on-site handling and collection – separation and processing –Incineration-Composting-Solid waste disposal methods –fundamentals of Land filling. Hazardous Waste: Characterization –Nuclear waste –Biomedical wastes –Electronic wastes
–Chemical wastes –Treatment and management of hazardous waste-Disposal and Control methods.

UNIT - IV

Environmental Sanitation: Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT - V

Sustainable Development: Sustainable Development: Definition-elements of sustainable developments-Indicators of sustainable development-Sustainability Strategies-Barriers to Sustainability–Industrialization and sustainable development –Cleaner production in achieving sustainability-sustainable development.

Text Books

1. Peavy, H. S., Rowe, D.R, Tchobanoglous, “Environmental Engineering”, G. Mc - Graw Hill International Editions, New York 1985..
2. G. Henry and G.W. Heinke, “Environmental Science and Engineering”, Pearson Education.

Reference Books

1. G. L. Karia and R.A. Christian, “Waste water treatment-concepts and design approach”, Prentice Hallof India
2. M.N.Rao and H.V. N. Rao, “Airpollution”, Tata Mc.GrawHill Company.
3. Ruth F. “Weiner andRobin Matthews Environmental Engineering”, 4thEdition Elesevier, 2003.
4. K. V. S. G. Murali Krishna, “Air Pollution and Control”by, Kousal & Co. Publications, New Delhi.

Course Outcome:

1. Define the air pollution control methods
2. Able to evaluate Volume and Strength reduction
3. Identify the different ways to dispose Solid waste
4. Identify the sanitation methods.
5. Products that accelerate more sustainable lifestyles

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	3		2		2	3		3	2		3
CO2	3	3		2		2	3		3	2		3
CO3	3	3		2		2	3		3	2		3
CO4	3	3		2		2	3		3	2		3
CO5	3	3		2		2	3		3	2		3

****END****