CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B. Tech- Electronics & Communication Engineering
CBCS & OUTCOME BASED 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 L	T	P	Credits	Maximum Marks 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	A402201	Basic Electrical Engineering	ESC	2	0	0	2	40	60
4	A405202	C Programming and Data Structures	ESC	3	0	0	3	40	60
5	A400502	Engineering Chemistry Laboratory	BSC	0	0	2	1	40	60
6	A404501	Elements of Electronics and Communication Engineering	ESC	0	0	2	1	50	-
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	A405503	C Programming and Data Structures 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 India	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 L	T	P	Credits	Maximum Marks 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	A404201	Basic Electronic Circuits	ESC	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	A404502	Basic Electronic Circuits Laboratory	ESC	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	L	T	P	Credits	CIE	SEE
				Hours per Week				Maximum Marks	
1	A400007	Numerical Methods and Complex Variables	BSC	3	1	0	4	40	60
2	A402205	Network analysis and Synthesis	ESC	3	0	0	3	40	60
3	A404301	Analog Circuits	PCC	3	0	0	3	40	60
4	A404302	Probability Theory and Stochastic Processes	PCC	3	0	0	3	40	60
5	A404303	Signals & Systems	PCC	3	0	0	3	40	60
6	A405506	Python Programming Laboratory	ESC	0	1	2	2	40	60
7	A404504	Analog Circuits Laboratory	PCC	0	0	2	1	40	60
8	A404505	Basic Simulation Laboratory	PCC	0	0	2	1	40	60
9	A400702	Gender Sensitization	MC	2	0	0	0	-	-
		Total:		17	2	6	20		
		Total hours per Week:		25					

SEMESTER – IV

S. No	Course Code	Course Title	Category	L	T	P	Credits	CIE	SEE
				Hours per Week				Maximum Marks	
1	A404304	Analog and Digital Communications	PCC	3	0	0	3	40	60
2	A404305	Switching Theory and Logic Design	PCC	2	0	0	2	40	60
3	A404306	Electromagnetic fields and Transmission Lines	PCC	3	0	0	3	40	60
4	A404307	Linear and Digital IC Applications	PCC	3	0	0	3	40	60
5	A404308	Electronic Circuit Analysis	PCC	3	0	0	3	40	60
6	A404507	Analog and Digital Communications Laboratory	PCC	0	0	2	1	40	60
7	A404508	Linear and Digital IC Applications Laboratory	PCC	0	0	2	1	40	60
8	A404509	Electronic Circuit Analysis & Switching Theory and Logic Design Laboratory	PCC	0	0	2	1	40	60
9	A400507	Social Innovation in Practice	HSMC	0	0	2	1	40	60
10	A404801	Real Time project/Field Based Projects	PROJ	0	0	4	2	50	-
11	A400701	Environmental Sciences	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	A404309	Professional Core Course	PCC	3	0	0	3	40	60
2	A404310	Professional Core Course	PCC	3	0	0	3	40	60
3		Control Systems	ESC	3	1	0	4	40	60
4	A404311	Professional Core Course	PCC	3	1	0	4	40	60
5	**PE-I**	**Professional Elective-1**	PEC	3	0	0	3	40	60
6	A400504	Advanced English Communication Skills Laboratory	HSMC	0	0	2	1	40	60
7	A404510	Professional Core Course Laboratory	PCC	0	0	2	1	40	60
8	A404512	Professional Core Course Laboratory	PCC	0	0	2	1	40	60
9	A400705	Intellectual property rights	MC	2	0	0	0	-	-
		Total:		**17**	**2**	**6**	**20**		
		Total hours per Week:		**25**					

				SEMESTER - VI						

S. No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	A404312	Professional Core Course	PCC	3	1	0	4	40	60
2	A404313	Professional Core Course	PCC	3	0	0	3	40	60
3	A404314	Professional Core Course	PCC	3	0	0	3	40	60
4	**PE-II**	**Professional Elective – II**	PEC	3	0	0	3	40	60
5	A404513	Professional Core Course Laboratory	PCC	0	0	2	1	40	60
6	A404514	Professional Core Course Laboratory	PCC	0	0	4	2	40	60
7	A404515	Professional Core Course Laboratory	PCC	0	0	2	1	40	60
8	A404516	Professional Core Course Laboratory	PCC	0	0	2	1	40	60
9	A404802	Industry Oriented Mini Project/Internship	PROJ	0	0	4	2	-	100
		Total:		**12**	**1**	**14**	**20**		
		Total hours per Week		**27**					
		Total Credits in III Year: 40							

								Maximum Marks	

SEMESTER - VII

| S. No | Course Code | Course Title | Category | Hours per Week | | | Credits | Maximum Marks | |
				L	T	P		CIE	SEE
1		Business Economics & Financial Analysis	HSMC	3	0	0	3	40	60
2		Professional Practice, law & Ethics	HSMC	2	0	0	2	40	60
3	PE-III	Professional Elective-III	PEC	3	0	0	3	40	60
4	PE-IV	Professional Elective-IV	PEC	3	0	0	3	40	60
5	OE-I	Open Elective-I	OEC	3	0	0	3	40	60
6	OE-II	Open Elective – II	OEC	3	0	0	3	40	60
7	A404803	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	PE-V	Professional Elective-V	PEC	3	0	0	3	40	60
2	PE-VI	Professional Elective-VI	PEC	3	0	0	3	40	60
3	OE-III	Open Elective – III	OEC	3	0	0	3	40	60
4	A404804	Technical Seminar	PROJ	0	0	4	2	-	100
5	A404805	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							

S. No	Course code	Course Name
OPEN ELECTIVE COURSES		
S. No	Course code	Course Name
OPEN ELECTIVE COURSE-I		
1	A404601	Fundamentals of Internet Of Things
2	A404602	Principles of Digital Signal Processing
3	A405602	Fundamentals of Operating Systems
4	A405604	Java Programming
5	A402601	Renewable Energy Sources
6	A402602	Basics of Power Electronics & Drives
7	A403601	Fundamentals of Engineering Materials
8	A403602	Basics of Thermodynamics
9	A401601	Disaster Preparedness & Planning Management
10	A401602	Environmental Impact Assessment
11	A400601	Basics of Logistics And Supply Chain Management
12	A400602	Industrial Relations
13	A462601	Fundamentals Of Cyber Security
14	A467801	Data Science Using R
15	A466601	Robotics
OPEN ELECTIVE COURSE-II		
16	A404603	Sensors & Transducers
17	A404604	Image Processing
18	A405601	Fundamentals of Database Management Systems
19	A405605	Web Programming
20	A402603	Electrical Vehicle Technology
21	A402604	Basics of Power Plant Engineering
22	A403603	Fundamentals of Manufacturing Processes
23	A403604	Fundamentals of Automobile Engineering
24	A401603	Remote Sensing & Geographical Information Systems
25	A401604	Solid Waste Management
26	A400603	Entrepreneurship
27	A400604	Ethics In Business & Corporate Governance
28	A462602	Cloud Computing
29	A467802	Linux Programming
30	A466602	Foundations Of Machine Learning
OPEN ELECTIVE COURSE-III		
31	A404605	Fundamentals Of Embedded Systems
32	A404606	Data Communications
33	A405603	Fundamentals of Computer Networks
34	A405606	Devops
35	A402605	Nano Technology
36	A402606	EV Batteries & Charging System
37	A403605	Industrial Safety Engineering
38	A403606	Waste To Energy
39	A401605	Energy Efficient Buildings
40	A401606	Environmental Pollution

41	A400605	Basics of Marketing
42	A400606	Intellectual Property Rights
43	A462603	Cyber Laws And Ethics
44	A467803	Business Intelligence
45	A466603	Artificial Neural Networks

(A400001) MATRICES AND CALCULUS
(Common to All)

	L	T	P	C

B.Tech (ECE): I Semester   **L 3   T 1   P 0   C 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 (Cartesianto 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), 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, (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 (ECE): 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 electrolessplating - 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. Bharathi kumari, 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 McGraw 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

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

B.Tech. I Sem.   **L T P C**
                                                                       2 0 0 2

Prerequisites: Mathematics

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. AbhijitChakrabarthi, SudiptaDebnath, 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	P09	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
CO4	3	3										2
CO5	3	3										2

(A405202) C PROGRAMMING& DATA STRUCTURES
(Common to ECE, EEE, Mech & Civil)

B.Tech (ECE): I Semester

L	T	P	C
3	0	0	3

UNIT-I
Overview of C: Basic structure of C programs, programming style, Executing a C program.
Constants, Variables, and Data Types: Introduction, Character set, C-Tokens, keywords and identifiers, constants, variables, Data types, declaration of variables, declaration of Storage class, assigning values to variables, defining symbolic constant.
Operators& Expressions: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment & Decrement Operators, Conditional Operators, Bitwise Operator, Special Operators. Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators.

UNIT-II
Decision Making: Introduction, Decision making with *if* statement, simple *if* statement, the *if---else---*statement, Nesting of *if---else---*statements. The ***else-if*** ladder, the ***switch*** statement, the? operator, the go to statement.
 Looping: Introduction, the *while* statement, the *do -while* statement, *for* statement, break and continue statements.
Arrays: Introduction, One-Dimensional Arrays, Declaration of One-Dimensional Arrays, Initialization of One-Dimensional Arrays, Two-Dimensional Arrays, Initializing two dimensional arrays.

UNIT-III
Character Arrays and Strings: Introduction, declaring and initializing string variables, reading strings from terminal, writing strings to screen, string-handling functions.
Functions: Introduction, definition of functions, return values, function calls, function declaration, scope, visibility and lifetime of variables.
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)

UNIT-IV
Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array, and linked representations.

UNIT-V
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. Programming in ANSI C, 8th Edition, E.Balagurusamy McGraw Hill Educationpublication,2019.
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

Reference Books
1. C Programming Absolute Beginner's Guide,3rd Edition, Pearson Education ,2014.
2. Learn C the Hard Way,1st Edition,Zed A.Shaw, Pearson Education,2018
3. The C-Programming Language,2nd Edition, Brian Kernighan and Dennis Ritchie, Pearson Education,2014.
4. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Course Outcomes
Students shall be able
CO1: Describe the structure of C program and explain the various components of it.
CO2: Use iterative statements for writing the C programs.
CO3: Organize data in Arrays and perform operations on data stored in Arrays.
CO4: Define & describe user defined functions in C language.
CO5: Differentiate structures, unions and manipulate data using pointers.

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

(A400502) ENGINEERING CHEMISTRY LABORATORY
(Common to all Branches)

	L	T	P	C
	0	0	2	1

B. Tech (ECE): 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. VenkataRamana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry (1st edition), SashiChawla, DhanapathRai& 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

(A404501) ELEMENTS OF ELECTRONICS AND COMMUNICATION ENGINEERING

B. Tech (ECE): I Semester

L	T	P	C
0	0	2	1

List of Experiments:

1. Understand the significance of Electronics and communications subjects
2. Identify the different passive and active components
3. Color code of resistors, finding the types and values of capacitors
4. Measure the voltage and current using voltmeter and ammeter
5. Measure the voltage, current with Multimeter and study the other measurements using Multimeter
6. Study the CRO and measure the frequency and phase of given signal
7. Draw the various Lissajous figures using CRO
8. Study the function generator for various signal generations
9. Study of Spectrum analyzer and measure the spectrum
10. Operate Regulated power supply for different supply voltages
11. Study the various gates module and write down the truth table of them
12. Identify various Digital and Analog ICs
13. Observe the various types of modulated signals.
14. Know the available Softwares for Electronics and communication application

TEXTBOOKS:

1. Electronic Devices and Circuits-R.L.Boylestad and Louis Nashelsky, 9 ed., 2006, PEI/PHI.

2. Kennedy, G., Electronic Communication Systems, McGraw-Hill (2008) 4th ed.

Course outcomes:

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

1. Understand the significance of various Electronics devices and communications systems
2. Identify different components used in the electronics and communication applications.
3. Measure various parameters by using different basic electronic measurement devices.
4. Identify the different Software's used for the Electronics & communication engineering.
5. Discriminate different signals and modulations used for the analog and digital communication systems.

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

(A402502) BASIC ELECTRICAL ENGINEERING LABORATORY
(Common to CSE, INF, ECE)

B.Tech. 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, SudiptaDebnath, 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		2									1
CO2	3		2									1
CO3	3		2									1
CO4	3		2									1
CO5	3		2									1

(A403502) COMPUTER AIDED ENGINEERING DRAWING

B.Tech I Sem.

L	T	P	C
1	0	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

(A405503) C PROGRAMMING& DATA STRUCTURES LABORATORY

(Common to ECE, EEE, Mech and Civil)

		L	T	P	C
B.Tech (ECE): I Semester		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:
Code Lite: 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]

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.)

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

III. Iterative statements
Demonstration
1. Write a program that reads an integer (5 digits or fewer) and determines and prints how many digits in the integer are 9s.
2. 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?
3. 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
Experiment
4. 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.

5. 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
```

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.
Experiment
4. Write a C program to find the GCD (greatest common divisor) of two given integers.
5. Write a C program to compute x^n

V. 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.

VI Data Structures
Demonstration
1. Write a program that uses functions to perform the following operations on singly linked list
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that implement stack (its operations) using
   i) Arrays ii) Pointers
3. Write a program that implement Queue (its operations) using
   i) Arrays ii) Pointers

Experiment
4. Write a program that uses functions to perform the following operations on doubly linked List.
   i) Creation ii) Insertion iii) Deletion iv) Traversal
5. Write a program that uses functions to perform the following operations on circular linked List. i) Creation ii) Insertion iii) Deletion iv) Traversal

VII Searching & Sorting
Demonstration
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 given sorted 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
5. Write a C program that sorts the given array of integers using selection sort in descending order
6. Write a C program that sorts the given array of integers using insertion sort in ascending order

Textbooks

1. Programming in ANSI C, 8th Edition, E. Balagurusamy McGraw Hill Education publication,2019.
2. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

Reference Books

1. C Programming Absolute Beginner's Guide,3rd Edition, Pearson Education ,2014.
2. Learn C the Hard Way,1st Edition, Zed A. Shaw, Pearson Education,2018
3. The C-Programming Language,2nd Edition, Brian Kernighan and Dennis Ritchie, Pearson Education, 2014.
4. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Course Outcomes
At the end 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
CO4: Develop applications using pointer concept.
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

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

B.Tech (ECE): 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)

L T P C
2 0 0 0

B.Tech (ECE): I Semester

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 - II Semester

L T P C
2 0 0 2

UNIT - I
Chapter entitled 'Toasted English' by R.K. Narayan from "English: Language, Context and Culture" published by Orient Black Swan, 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 BlackSwan, 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 BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English Grammar: Redundancies and Clichés in Orland 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, (2ndedition) Chaudhuri, SantanuSinha, 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 - 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}, $\sin ax$, $\cos ax$, polynomials in x, $e^a(x)$ 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 Irrational 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, (36th Edition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5th Edition), R.K. Jainand S.R.K. Iyengar, NarosaPublications, 2016.

REFERENCE BOOKS:
1. Advanced Engineering Mathematics, (9th Edition), Erwinkreyszig, John Wiley& Sons, 2006.
2. Calculus and Analytic geometry, (9th Edition), 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, (9th Edition), H.K. Dass and Er. RajnishVerma, 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 - 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:
Introduction to 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, Clasius-Mossoti Equation ferroelectric, piezoelectric, and pyro electric 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 analyse the importance of semiconductors and semiconductor devices in Science and Engineering Applications.
3. Appreciate the features and applications of Lasers and Optical fibres.
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

(A404201) BASIC ELECTRONIC CIRCUITS

B. Tech. (ECE) II-Semester

L T P C
3 0 0 3

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, **BJT Biasing:** Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self-Bias, Bias Stability, Bias Compensation using Diode

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, FET- Biasing Techniques, MOSFET, MOSTET as a capacitor.

UNIT – V
Special Purpose Devices: Zener Diode **-** Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

TEXT BOOKS:
1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**

REFERENCE BOOKS:
1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5thEdition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles andApplications, Cambridge, 2018.

Course Outcomes
At the end of the course the student will be able to:
1. Acquire the knowledge of PN junction Diode characteristics and switching times.
2. Acquire the knowledge of various electronic circuits like rectifiers, clippers, Clampers and their use on real life
3. Acquire the knowledge about construction, working of BJT and analyze various biasing, stabilization techniques for transistor amplifier design.
4. Acquire the knowledge about construction, working of FET, MOSFET and analyze various biasing, techniques for FET amplifier design.
5. Acquire the knowledge about the role of special purpose devices and their applications.

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

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

B.Tech - II Semester

L	T	P	C
0	0	2	1

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-Neutralizing 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 Communication Presentation 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) by Shobha, 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. Neutralize 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 - 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 b) 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.

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

(A404502) BASIC ELECTRONIC CIRCUITS LABORATORY

B. Tech. (ECE) II-Semester

L	T	P	C
0	0	3	1.5

List of Experiments (Twelve experiments to be done):

Verify any twelve experiments in H/W Laboratory

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Full Wave Rectifier with & without filters
3. Types of Clippers at different reference voltages
4. Types of Clampers at different reference voltages
5. The steady state output waveform of clampers for a square wave input
6. Input and output characteristics of BJT in CB Configuration
7. Input and output characteristics of BJT in CE Configuration
8. Input and output characteristics of BJT in CC Configuration
9. Input and output characteristics of MOS FET in CS Configuration
10. Input and output characteristics of MOS FET in CD Configuration
11. Switching characteristics of a transistor
12. Zener diode characteristics and Zener as voltage Regulator
13. SCR Characteristics.
14. UJT Characteristics and identify negative region
15. Photo diode characteristics
16. Solar cell characteristics
17. LED Characteristics
    *Design a circuit to switch on and off LED using diode/BJT/FET as a switch.

Major Equipment required for Laboratories:

1. Regulated Power Suppliers, 0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multimeters, voltmeters and Ammeters
5. Electronic Components and devices

Course Outcomes

On Completion of the course, students will be able to

1. Acquire the knowledge of various semiconductor devices, electronic Circuits and their use in real life.
2. Acquire the knowledge about Input and output Characteristics of BJT, MOSFET in various configurations.
3. Design aspects of biasing and keep them in active region of the device for functional circuits
4. Acquire the knowledge about the V-I characteristics of UJT and SCR.
5. Acquire the knowledge about the role of special purpose devices and their applications

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

(A405504) IT WORKSHOP

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

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

Course Objectives:
- To impart the knowledge of various hardware components of a computer
- To provide the skill of assembling the computer.
- To impart the knowledge and usage of various Microsoft tools such as Power Point, Word and Excel

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram 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 instructors should 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 are 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

Power point

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point 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.

END
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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)

	L	T	P	C
	0	0	3	1.5

B.Tech II Semester

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)

B.Tech II Semester

L T P C
2 0 0 0

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 Order from 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

(A400007) NUMERICAL METHODS AND COMPLEX VARIABLES
(Common to EEE and ECE)

	L	**T**	**P**	**C**
B.Tech. III Semester	**3**	**1**	**0**	**4**

UNIT-I
NUMERICAL METHODS-I:
Solution of polynomial and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regular-False method.
Interpolation: Finite differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation, Gauss's forward and backward formulae, Lagrange's method of interpolation.

UNIT-II
NUMERICAL METHODS-II:
Numerical integration: Trapezoidal rule, Simpson's 1/3rd and 3/8 rules.
Numerical Solutions of Ordinary Differential Equations -Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order.

UNIT-III
COMPLEX VARIABLES: DIFFERENTIATION
Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne-Thomson's methods, Analytic function, Harmonic function, Finding harmonic conjugate, Conformal mapping and Mobius transformations.

UNIT-IV
COMPLEX VARIABLES: INTEGRATION
Line integrals, Cauchy's theorem, Cauchy's Integral formula, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof), Zeros of analytic functions, singularities.
Complex Power series: Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (without proof)
.
UNIT-V
FOURIERSERIES &FOURIERTRANSFORMS:
Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sineandcosine Transforms-Inverse Fourier transforms.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5thEdition), R.K. JainandS.R.K. Iyengar, NarosaPublications,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. Introductory methods of Numerical Analysis, (4th Edition), S.S. Sastry, PHI, 2005.
4. Complex Variables and Applications, (7thEdition), J. W. Brown and R. V. Churchill, Mc-Graw Hill, 2004.

COURSE OUTCOMES:
On completion of the course students will be able to
1. Find the root of given equation and estimate unknown value using interpolation.
2. Find numerical solutions of ordinary differential equations.
3. Analyze the complex function with reference to their analyticity.
4. Evaluate integrals using Cauchy's integral and residue theorems, Taylor's and Laurent's series expansions of complex function.
5. Express any periodic function in terms of sine and cosine.

(A402205) NETWORK ANALYSIS AND SYNTHESIS

B.Tech. III Sem.   L   T   P   C
                                                                          3   0   0   3

UNIT - I

Network Topology: Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT - II

Transient and Steady state analysis: RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. RC Circuits as integrator and differentiators. 2nd order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

UNIT - III

Two port network parameters: Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T, π, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT-IV

Filters: Classification of Filters, Filter Networks, Constant-K Filters-Low pass, high pass, Band pass, band-stop filters, M-derived Filters- T and π filters- Low pass, high pass
Attenuators: Types – T, π , L, Bridge T and lattice ,Asymmetrical Attenuators T, π , L Equalizers-Types- Series, Shunt, Constant resistance, bridge T attenuation, bridge T phase, Lattice attenuation, lattice Phase equalizers

UNIT – V

Network Synthesis: Driving point impedance and admittance, transfer impedance and admittance, network functions of Ladder and non-ladder networks, Poles, Zeros analysis of network functions**,** Hurwitz polynomials, Positive Real Functions, synthesis of LC, RC and RL Functions by foster andcauser methods.

TEXT BOOKS:
1. Van Valkenburg -Network Analysis, 3rd Ed., Pearson, 216.
2. JD Ryder - Networks, Lines and Fields, 2nd Ed., PHI, 1999.

REFERENCE BOOKS:
1. J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education,1999.
2. A. Sudhakar and Shyammohan S Palli - Networks & Circuits, 4th Ed., Tata McGraw-HillPublications
3. William Hayt and Jack E. Kimmerley - Engineering Circuit Analysis, 6th Ed., William Hayt andJack E. Kimmerley, McGraw Hill Company

COURSE OUTCOMES: Upon successful completion of the course, students will be able to:
1. Gain the knowledge on basic RLC circuit's behaviour.
2. Analyse the Steady state and transient analysis of RLC Circuits.
3. Characterization of two port network parameters.
4. Analyse the Design aspect of various filters and attenuators.
5. Analyse and Synthesise different network functions

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

(A404301) ANALOG CIRCUITS

B. Tech. (ECE) III-Semester

L T P C
3 0 0 3

UNIT-I

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h- parameters in CE, CB and CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

UNIT - II
FET Amplifiers: Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOSFET Amplifiers, MOS Small signal model, Common source amplifier with resistive, Diode connected and Current source loads, Source follower, Common Gate Stage, Cascode and Folded Cascode Amplifier – frequency response.

UNIT - III
Multistage Amplifiers: Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade RC Coupled amplifiers, Cascode amplifier, Darlington pair.
Transistor at High Frequency: Hybrid -πmodel of Common Emitter transistor model, fα, fβ and unity gain bandwidth, Gain-bandwidth product.

UNIT - IV
Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current Shunt Feedback configurations – Simple problems.

UNIT - V
Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

TEXT BOOKS:
1. Jacob Millman, Christos C Halkias -Integrated Electronics, McGraw Hill Education.
2. Robert L. Boylestead, Louis Nashelsky -Electronic Devices and Circuits theory, 11th Edition,2009, Pearson

REFERENCE BOOKS:
1. David A. Bell – Electronic Devices and Circuits, 5th Edition, Oxford.
2. Adel S. Sedra, Kenneth C. Smith- Microelectronic Circuits- Theory and Applications, Oxford.
3. Chinmoy Saha, Arindam Halder, Debaati Ganguly -Basic Electronics-Principles and Applications, 2018, Cambridge.

COURSE OUTCOMES
Upon successful completion of the course, students will be able to:
1. Design single stage amplifiers using BJT
2. Design single stage amplifiers using FET
3. Design multistage amplifiers and understand the concepts of High Frequency Analysis of BJT.
4. Utilize the Concepts of negative feedback to improve the stability of amplifiers
5. Utilize the Concepts of positivefeedback to generate sustained oscillations

	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

(A404302) PROBABILITY THEORY AND STOCHASTIC PROCESSES

B. Tech. (ECE) III-Semester

L T P C
3 0 0 3

UNIT - I
Probability & Random Variable: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, *Random Variable*-Definition, Conditions for a Function to be a Random Variable,Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT - II
Operations on Single & Multiple Random Variables – Expectations: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-Monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.
Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence.
Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT - III
Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelationFunction of Response, Cross-Correlation Functions of Input and Output.

UNIT - IV
Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT - V
Noise Sources & Information Theory: Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off betweenbandwidth and SNR.

TEXT BOOKS:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4th Ed, TMH,2001.
2. Taub and Schilling - Principles of Communication systems, TMH, 2008

REFERENCE BOOKS:

1. Bruce Hajck - Random Processes for Engineers, Cambridge unipress, 2015
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002.
3. B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003.
4. S.P Eugene Xavier -Statistical Theory of Communication, New Age Publications, 2003

Course Outcomes:

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

1. Perform operations on single and multiple Random variables.
2. Determine the Spectral and temporal characteristics of Random Signals.
3. Characterize LTI systems driven by stationary random process by using ACFs and PSDs.
4. Understand the concepts of Noise and Information theory n Communication systems
5. Analyze the response of a linear time invariant (LTI) system driven by stationary random processes using the time domain and frequency domain description of random processes.

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

(A404303) SIGNALS & SYSTEMS

B. Tech. (ECE) III-Semester

L	T	P	C
3	0	0	3

UNIT - I
Signal Analysis: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT – II
Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.
Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction toHilbert Transform.

UNIT - III
Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

UNIT – IV
Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT - V
Sampling theorem: Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.
Correlation: Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

TEXT BOOKS
1. B.P. Lathi -Signals, Systems & Communications, BSP, 2013.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawabi -Signals and Systems, 2nd Ed., Prentice Hall

REFERENCE BOOKS
1. Signals and Systems – A. Anand Kumar, PHI Publications, 3rd edition,2013
2. Simon Haykin and Van Veen, A. Rama Krishna Rao, -Signals and Systems, TMH, 2008.
3. Michel J. Robert - Fundamentals of Signals and Systems, MGH International Edition, 2008.
4. C. L. Philips, J. M. Parr and Eve A. Riskin -Signals, Systems and Transforms, 3rd Ed., PE,2004.

Course Outcomes

Upon completing this course the students will be able to:

1. Characterize various signals and systems.
2. Analyze signals in time and frequency domain using various transform techniques.
3. Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
4. Use sampling theorem for baseband and band pass signals for various types of sampling and for different duty cycles.
5. Apply the correlation and PSD functions for various applications.

CO's	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

(A405506) PYTHON PROGRAMMING LABORATORY
(Common to all)

	L	T	P	C
B.Tech III Semester	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 without 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.

Reference Books:

1.Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
3. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
4. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019.

Web links:
   1. https://docs.python.org/3/tutorial/modules.html#packages
   2. https://www.includehelp.com/python/programs.aspx.
   3. https://www.anaconda.com/products/individual
   4. https://www.jetbrains.com/pycharm/

Course Outcomes

Students shall be able to:
   CO1 Design solutions to computational problems using Python programming language constructs.
   CO2 Write python programs to manipulate string objects.
   CO3 Use Appropriate Data structures to organize and manipulate data items.
   CO4 Design modular application using python module & package concepts.
   CO5 Develop application to read and write from various file formats.

(A404504) ANALOG CIRCUITS LABORATORY

B. Tech. (ECE) III-Semester

L	T	P	C
0	0	2	1

List of Experiments (Twelve experiments to be done):
Experiments marked with * has to be designed, simulated and verified in hardware

1. Perform an experiment to choose Q-point for a Transistor that operate in active region andobserve the effect of external Load resistance on Q-point.
2. Design a Self-Bias Circuit and determine the Q-point of the Transistor and its Stability factor byboth simulation and realization with hardware components.
3. Obtain the I/O Characteristics of CE, CB, CC amplifiers. Calculate h-parameters from the Characteristics.
4. Design and Simulate a Common Drain Amplifier with voltage divider bias and determine theStability factor.
5. Obtain the Drain and Transfer characteristics of CD, CS amplifiers of JFET. Calculate gm, rd fromthe Characteristics.
6. By experiment prove that the voltage gain of Emitter Follower Circuit is one.
7. *Design a Common Emitter Amplifier with a gain of 30db and Bandwidth of 10KHZ and plot thefrequency response practically.
8. *Design a two stage RC Coupled amplifier and prove that gain is increased and analyze theeffects of coupling capacitance.
9. *Practically prove that the Darlington pair has high input impedance.
10. Draw the high frequency response of common emitter transistor amplifier and calculate $f\alpha$, $f\beta$ and gain bandwidth product.
11. *Design MOSFET Amplifier and verify the input and output characteristics.
12. Design four topologies of feedback amplifiers and draw the frequency response of them withand without feedback.
13. *Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
14. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.

Major Equipment required for Laboratories:
1. Computer System with latest specifications connected
2. Window XP or equivalent
3. Simulation Software-Multisim or any equivalent simulation software
4. Regulated Power Suppliers, 0-30V
5. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
6. Functions Generators-Sine and Square wave signals
7. Multimeters
8. Electronic devices

Course Outcomes:
Upon completing this course, the student will be able to
1. Design amplifiers with required Q point and analyse amplifier characteristics
2. Examine the effect multistage amplification on frequency response
3. Investigate feedback concept in amplifiers and oscillator.
4. Utilize the Concepts of negative feedback to improve the stability of amplifiers
5. Utilize the Concepts of positivefeedback to generate sustained oscillations

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

(A404505) BASIC SIMULATION LABORATORY

B. Tech. (ECE) III-Semester

L	T	P	C
0	0	2	1

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

List of Experiments:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum
6. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
7. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
8. Convolution for Signals and sequences.
9. Waveform Synthesis using Laplace Transform.
10. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
11. Verification of Sampling Theorem.
12. Auto Correlation and Cross Correlation for Signals and Sequences.
13. Removal of noise by Autocorrelation / Cross correlation.
14. Extraction of Periodic Signal masked by noise using Correlation.

Major Equipment required for Laboratories:
1. Computer System with latest specifications connected
2. Window Xp or equivalent
3. Simulation software-MAT Lab or any equivalent simulation software

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

1. Examine various signals/sequences and demonstrate different operations on signals/sequences using MATLAB.
2. Evaluate the Fourier transform of a signal and plot its magnitude and phase spectrum.
3. Analyze and characterize continuous time systems in both time and frequency domain.
4. Test the sampling theorem using MAT lab.
5. Describe the waveform synthesis using Laplace transform and plot pole -zero maps in s plane and z plane.

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

(A400702) GENDER SENSITIZATION
(Common to all branches)

B. Tech. (ECE) III-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.–Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

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: Speaking Out Is Home a Safe Place? –When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

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 Parks The Brave Heart.

REFERENCE BOOKS
1. Towards a World of Equals: A Bilingual Textbook on Gender, A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, VasudhaNagaraj, AsmaRasheed, GoguShyamala, 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 legal aspects 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 division of labour and its relation 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	-	-	--	-	-	-	-	-	-

(A404304) ANALOG AND DIGITAL COMMUNICATIONS

B. Tech. (ECE) IV-Semester

L	T	P	C
3	0	0	3

UNIT - I

Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT - II

Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

UNIT - III

Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters
Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

UNIT - IV

Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. **Pulse Code Modulation:** PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT - V

Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.
Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

TEXT BOOKS
1. Simon Haykin -Analog and Digital Communications, John Wiley, 2005.
2. Wayne Tomasi - Electronics Communication Systems-Fundamentals through Advanced, 5th Ed., PHI, 2009.

REFERENCE BOOKS
1. Herbert Taub, Donald L Schilling, Goutam Saha, -Principles of Communication Systems, 3rd Ed., McGraw-Hill, 2008.
2. Dennis Roddy and John Coolean - Electronic Communications, 4th Ed., PEA, 2004
3. George Kennedy and Bernard Davis - Electronics & Communication System, TMH, 2004
4. K. Sam Shanmugam - Analog and Digital Communication, Willey, 2005

Course Outcomes

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

1. Design and analyze various Analog and Digital Modulation and Demodulation techniques.
2. Model the noise present in continuous wave Modulation techniques.
3. Implement the Super Heterodyne Receiver concept and Pulse Modulation Techniques in various applications
4. Perform measurements of AM/FM Transmitter.
5. Analyze and design the base band Transmission

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

(A404305) SWITCHING THEORY AND LOGIC DESIGN

B. Tech. (ECE & EEE) IV-Semester

L	**T**	**P**	**C**
2	**0**	**0**	**2**

UNIT-I

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weightedcodes and its Properties, Parity check code and Hamming code.

Boolean algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT-II

Minimization of Boolean functions: Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters,

UNIT-III

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.
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UNIT-IV

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters.

UNIT-V

Finite state machine: capabilities and limitations, Mealy and Moore models, State equivalence and machine minimization, simplification of incompletely specified machines, Merger graphs.

TEXT BOOKS
1. Zvi Kohavi &Niraj K. Jha, - Switching and Finite Automata Theory, 3rd Ed., Cambridge, 2010.
2. Digital Design -Morris Mano, PHI, 3rd Edition, 2006.

REFERENCE BOOKS
1. R. P. Jain - Modern Digital Electronics, 3rd Edition, 2007- Tata McGraw-Hill
2. Charles H. Roth - Fundamentals of Logic Design, 5th ED., Cengage Learning, 2004.

Course Outcomes

Upon Completion of the Course, Students will be able to
1. Identify the various number systems.
2. Apply the basic theorems to simply the Boolean Functions.
3. Design Combinational circuits for various applications.
4. Design simple Sequential Circuits.
5. Distinguish the Finite State Machines and Algorithmic StateMachines Charts.

	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

(A404306) ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

B. Tech. (ECE) IV-Semester

L	T	P	C
3	0	0	3

UNIT – I
Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Energy Density. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors.

UNIT – II
Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

UNIT – III
Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Two Equations for Magnetostatic Fields, Maxwell's Two Equations for Electrostatic Fields Maxwell's Equations in Different Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

UNIT – IV
EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization.
Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem.

UNIT – V
Transmission Lines: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.SC and OC Lines, $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines, Reflection Coefficient, VSWR Smith Chart – Configuration and Applications, Single Stub Matching.

TEXT BOOKS:
1. Matthew N.O. sadiku and S.V. Kulkarni - Principles of Electromagnetics, 4th Ed., Oxford University Press, Aisan Edition, 2015.
2. Umesh Sinha, Satya Prakashan -Transmission Lines and Networks, (Tech. India Publications), New Delhi, 2001

REFERENCE BOOKS:
1. JD. Kraus -Electromagnetics with Applications ,5th Ed., TMH
2. William H. Hayt Jr. and John A. Buck- Engineering Electromagnetics, 8th Ed., McGraw Hill,2014
3. JD Ryder -Networks, Lines and Fields, 2nd Ed., PHI, 1999

Course Outcomes

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

1. Explain the concepts of electrostatics using vector calculus and coordinate systems.
2. Explain the magnetic field intensity using Biot-Savart's law and Ampere's law.
3. Explain the concepts of Time varying fields using Maxwell's Equations.
4. Analyze the characteristics of electromagnetic waves and describe Poynting theorem.
5. Summarize the various characteristics of transmission line and stub matching using Smith chart..

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

(A404307) LINEAR AND DIGITAL IC APPLICATIONS

B. Tech. (ECE) IV-Semester

L	T	P	C
3	0	0	3

UNIT - I

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, features of 741 Op-Amp, Modes of Operation-Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT - II

Op-Amp, IC-555 & IC565 Applications: Introduction to Active Filters, Characteristics of Bandpass, Bandreject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer-Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL-Block Schematic, principle and Applications.

UNIT - III

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT - IV

Combinational Logic ICs: Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V

Sequential Logic IC's and Memories: Familiarity with commonly available 74XX & CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.
Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS:

1. Ramakanth A. Gayakwad - Op-Amps & Linear ICs, PHI, 2003.
2. Floydand Jain- Digital Fundamentals, 8th Ed., Pearson Education,2005.

REFERENCE BOOKS:

1. D. Roy Chowdhury – Linear Integrated Circuits, New Age International(p)Ltd,2nd Ed., 2003.
2. John. F. Wakerly – Digital Design Principles and Practices, 3rdEd., Pearson, ,2009.
3. Salivahana -Linear Integrated Circuits and Applications, TMH, 2008.
4. William D.Stanley- Operational Amplifiers with Linear Integrated Circuits, 4thEd., Pearson Education India, 2009.

Course Outcomes

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

1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and design applications of IC555 and IC565.
3. Acquire the knowledge and design the Data converters.
4. Choose the proper Combinational digital integrated circuits by knowing their characteristics.
5. Choose the proper Sequential digital integrated circuits by knowing their characteristics

	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

(A404308) ELECTRONIC CIRCUIT ANALYSIS

B. Tech. (ECE) IV-Semester

L T P C
3 0 0 3

UNIT - I
Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class –C and D Amplifiers.

UNIT- II
Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, frequency response, Double Tuned Amplifiers – Q-factor, frequency response, Concept of stagger tuning and synchronous tuning

UNIT - III
Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

UNIT - IV
Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods of Linearity improvement.

UNIT - V
Synchronization and Frequency Division: Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuits, Stability of Relaxation Devices, Astable Relaxation Circuits, Monostable Relaxation Circuits, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.
Sampling Gates: Basic operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits

TEXT BOOKS:
1. Jacob Millman, Christos C Halkias - Integrated Electronics, , McGraw Hill Education.
2. J. Millman, H. Taub and Mothiki S. PrakashRao - Pulse, Digital and Switching Waveforms –2nd Ed., TMH, 2008,

REFERENCE BOOKS:
1. David A. Bell - Electronic Devices and Circuits, 5th Ed., Oxford.
2. Robert L. Boylestead, Louis Nashelsky - Electronic Devices and Circuits theory, 11th Ed.,Pearson, 2009
3. Ronald J. Tocci - Fundamentals of Pulse and Digital Circuits, 3rd Ed., 2008.
4. David A. Bell - Pulse, Switching and Digital Circuits, 5th Ed., Oxford, 2015

Course Outcomes
Upon successful completion of the course, students will be able to:
1. Design the power amplifiers
2. Design the tuned amplifiers and analyse its frequency response
3. Design Multivibrators and Schmitt trigger circuits.
4. Design sweep circuits for various applications.
5. Utilize the concepts of synchronization, frequency division and sampling gates

	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

(A404507) ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

B. Tech. (ECE) IV-Semester

L T P C
0 0 2 1

Note:

• Minimum 12 experiments should be conducted:

• All these experiments are to be simulated first either using MATLAB, COMSIM or any other simulation package and then to be realized in hardware

List of Experiments:

1. (i) Amplitude modulation and demodulation (ii) Spectrum analysis of AM
2. (i) Frequency modulation and demodulation (ii) Spectrum analysis of FM
3. DSB-SC Modulator & Detector
4. SSB-SC Modulator & Detector (Phase Shift Method)
5. Frequency Division Multiplexing & De multiplexing
6. Pulse Amplitude Modulation & Demodulation
7. Pulse Width Modulation & Demodulation
8. Pulse Position Modulation & Demodulation
9. PCM Generation and Detection
10. Delta Modulation
11. DPCM Generation and Detection
12. Frequency Shift Keying: Generation and Detection
13. Binary Phase Shift Keying: Generation and Detection
14. Generation and Detection (i) DPSK (ii) QPSK
15. Generate FSK modulated signal using PLL

   *Prove practically the Figure of Merit of DSB-SC is unity for single tone modulation

Major Equipment required for Laboratories:

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Trainer kits
5. MAT Lab/Equivalent Simulation Package with Communication tool box

Course Outcomes

Upon completing this course, the student will be able to

1. Design and implement various Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics
2. Design and implement various Pulse modulation and demodulation Techniques and observe the time and frequency domain characteristics
3. Apply Frequency Division Concepts in Different Modulation Techniques.
4. Apply different types of Sampling with various Sampling rates and duty Cycles
5. Design and implement various Digital modulation and demodulation Techniques and observe the waveforms of these modulated Signals practically

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

(A404508) LINEAR AND DIGITAL IC APPLICATIONS LABORATORY

B. Tech. (ECE) IV-Semester

L	T	P	C
0	0	2	1

Note:
- Minimum 12 experiments should be conducted.
- Verify the functionality of the IC in the given application.

Design and Implementation of:
1. Design an Inverting and Non-Inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of A=B, A<B, A>B.
4. Design an Integrator and Differentiator Circuits using IC741 and derive the required conditionpractically.
5. Design an Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.
6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ anddraw the output waveform.
7. Construct Mono-stableMultivibratorusingIC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its dutycycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Weighted register DAC and find its resolution and write a truth table with respective voltages.
11. Design VoltageRegulatorusingIC723, IC 7805/7809/7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
13. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.
14. Design BCD to 7- Segment Converter and verify its truth table.
15. Verify the functionality of JK Master - Slave flipflop (74LS73).
16. Design a 8x1 multiplexer using digital ICs.
17. Design a 4-bit Adder/Subtractor using digital ICs and Add/Sub the following bits.(i)1010   (ii)0101   (iii)1011
     0100   0010   1001.
18. Design a Decade counter and verify its truth table and draw respective waveforms.
19. Design a Up/down counter usingIC74163 and draw read/write waveforms.
20. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
21. Design a 16x4 RAM using 74189 and draw its read/write operation.
22. Design a 8x3 encoder/3x8 decoder and verify its truth table.

Major Equipment required for Laboratories:
1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply; Multimeter
2. 20 MHz Oscilloscope with Dual Channel; Bread board and components/Trainer Kit;

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

1. Design and implementation of various analog circuits using 741 ICs.
2. Design and implementation of various Multivibrators using 555 timer.
3. Design and implement various Cominational circuits using digital ICs.
4. Design and implement various Sequential circuits using digital ICs
5. Design and implement ADC, DAC and voltage regulators

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

(A404509) ELECTRONIC CIRCUIT ANALYSIS & SWITCHING THEORY AND LOGIC DESIGN LABORATORY

B. Tech. (ECE) IV-Semester

L	T	P	C
0	0	2	1

ECA LAB EXPERIMENTS:

Hardware Testing in Laboratory: (Minimum 6 experiments to be done)

1. Design transformer coupled class A power amplifier and draw the input and output waveformsfind its efficiency
2. Prove that the complementary symmetry push pull amplifier eliminate cross over distortion.
3. Design class C power amplifier and draw the input and output waveforms
4. Design a single tuned amplifier and determine the Q of its tuned circuit practically.
5. Design a Bistable Multivibrator and analyze the effect of commutating capacitors anddraw the wave forms at base and collector of transistors.
6. Design an Astable Multivibrator and draw the wave forms at base and collector oftransistors.
7. Design a Monostable Multivibrator and draw the input and output waveforms
8. Draw the response of Schmitt trigger for gain of greater than and less than one.
9. Design a Bootstrap sweep circuit using BJT and draw its output time base waveform

STLD LAB EXPERIMENTS:
(Minimum 6 experiments to be done)

1. Realization of given Boolean function using universal gates and minimizing the same. Compare the gate count before and after minimization.
2. Design and realize Full Adder circuit using gates/universal gates. Implement Full Subtractor using fladder.
3. Realize 2:1 MUX using the given gates and Design 8:1 using 2:1 MUX.
4. Realize a 2x4 Decoder using logic gates and implement 3x8 Decoder using 2x4 Decoder.
5. Verification of truth tables of flip-flops using different clocks (level triggering, positive and negativeedge triggering) also converts the given flipflop from one type to other.
6. Designing of Universal n-bit shift register using flipflops and Multiplexers. Draw the timing diagramof the Shift Register.
7. Design a Synchronous binary counter using D-flipflop/given flipflop.
8. Designing of MOD 8 Counter using JK flipflops.
9. Designing of sequence detecting State Machine with minimal states using the given flipflops.

Major Equipment required for Laboratories:

1. Regulated Power Suppliers, 0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multimeters
5. Electronic Components
6. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply.
7. Bread board and components/ Trainer Kit

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

1. Design power amplifiers and find its efficiency
2. Design tuned amplifiers and find its Q-factor
3. Design various Multivibrators and sweep circuits. Understand the necessity of linearity
4. Understand the working of logic families and logic gates.
5. Design and implement Combinational and Sequential logic circuits.

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

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

```
L   T   P   C
0   0   2   1
```

Week-1
Identify community issues to be addressed, Requirements Analysis: Extensive User requirements analysis
Week-2
Generating effective System Requirement document
Week-3
Social Innovation – Case Studies
Week-4
Impact of Social Innovation on communities
Week-5
Process of Social Innovation Prompts – identifying needs, Proposals –generating ideas,
Prototyping – testing the idea in practice,
Week-6
Sustaining-developing a business model, Scaling and diffusion-growing social innovations, Systematic change
Week-7
Introduction to sustainability, Sustainability leadership, Life cycle assessment
Week-8
Carbon footprint Calculation
Week-9
Types of Start-Ups, Types of business models, Market risks and Marketing strategies
Week-10
Verification of Business Model and Validation
Week-11
Business Model Development
Week-12
Documentation and Panel presentation

Course Outcomes
On Completion of the course, the students will be able to
1. Identify several social issues to be addressed
2. Analyze 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

Reference Books
1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, Yeheskel Hasenfeld; Palgrave Macmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean
4. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

	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

(A400701) ENVIRONMENTAL SCIENCES
(Common to All Branches)

B. Tech. (ECE) IV-Semester   L T P C
                                                   2 0 0 0

UNIT-I
Environmental Studies: 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
Bio-diversity 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 wild life, loss of species, seeds, etc. Conservation of bio-diversity– In-situ 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 on the 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, Equitable use of resources for sustainable life styles, Environmental Impact Assessment.

Text Books
   1. Environmental Science (1st edition), Y.Anjaneyulu, B S Publications.
   2. Environmental studies (1st edition), Deekshadave, Cengage learning India Pvt. Ltd.

Reference books
   1. Environmental sciences and Engineering (1st edition), P. VenugopalRao, PHI learning Pvt. Ltd.,
   2. Environmental Science and Technology (1st edition), M. Anji Reddy, B S Publications.
   3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
   4. Environmental Encyclopedia (Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.

Course Outcomes:

On successful completion of this course, it is expected that students should be able to
   1. Acquire the knowledge on environmental science
   2. Acquire the knowledge of various natural resources
   3. Understand the importance of conservation and preserve the biodiversity
   4. Understand the hazardous effects of environmental pollution
   5. Develop skills in understanding 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

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

B. Tech. (ECE)

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, 1stEdition, 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.

	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)

B. Tech. (ECE)

L	T	P	C
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 low pass 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 (4 th Edition)

References:

1. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007
2.E.C. Ifeachor and B.W. Jervis, " Digital signal processing - A practical approach", Second edition, 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

	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

(A405602) FUNDAMENTALS OF OPERATING SYSTEMS
(Open Elective-I)

B. Tech (ECE)

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

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. Will be able to control access to a computer and the files that may be shared
2. Demonstrate the knowledge of the components of computers and their respective roles in computing.
3. Ability to recognize and resolve user problems with standard operating environments.
4. Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.

(A405604) JAVA PROGRAMMING
(OPEN ELECTIVE-I)

B. Tech (ECE)

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

(A402601) RENEWABLE ENERGY SOURCES
(OPEN ELECTIVE-I)

B. Tech (ECE)

L	T	P	C
3	0	0	3

UNIT I: GLOBAL AND NATIONAL ENERGY SCENARIO
Over view 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. Wind mill 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: BIO GAS
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.

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.

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

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

B. Tech (ECE)

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:
6. Explain the construction and characteristics of Power semiconductor devices
7. Analyze the operation of single phase and three phase ac-to-dc converters.
8. Analyze various three phase converters
9. Compare the various types of dc-to-dc converters.
10. Apply the knowledge of power electronic converter for various applications.

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

(A403602) BASICS OF THERMODYNAMICS
(Open Elective: 1)

	L	T	P	C
B. Tech (ECE)	**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 different air standard cycles.

(A403603) FUNDAMENTALS OF MANUFACTURING PROCESSES
(Open Elective: 1)

B. Tech (ECE)	**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.

(A401601) DISASTER PREPAREDNESS & PLANNING MANAGEMENT
(Open Elective – I)

B.Tech (ECE)   **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, food safety, 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 of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

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, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCE:

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 of California, EMSA no.214, June 2003

COURSE OUTCOMES: On completion of the course students will be able to

1. The application of Disaster Concepts to Management
2. Analyzing Relationship between Development and Disasters.
3. Ability to understand Categories of Disasters
4. Realization of the responsibilities to society
5. Understand Impacts of Disasters Key Skills Understand

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

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

B.Tech (ECE)   **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

COURSE OUTCOMES: On completion of the course students will be able to
1. identify the attributes to be considered for EIA
2. assess impact of deforestation
3. interpret impact prediction, significance of soil quality and mitigation
4. conduct environmental audit and prepare reports
5. illustrate environmental policies and provisions

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

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

B. Tech (ECE)

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.

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.

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

(A400602) INDUSTRIAL RELATIONS
(Open Elective – I)

B. Tech (ECE)

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 Wages Act, 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 Grievance Procedure.
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 Publishing companyLtd.
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 Industrial Relations. 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

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

	L	**T**	**P**	**C**
B. Tech (ECE)	**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 Sunit Belpure, 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

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

	L	T	P	C
B. Tech (ECE)	**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.

(A466601) ROBOTICS
(OPEN ELECTEIVE-I)

B. Tech (ECE)

L	T	P	C
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, Create space 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.

(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. Thermo emf 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 cell types, 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 and Quantization, 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

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

B. Tech (ECE)

L	T	P	C
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.

END

(A405605) WEB PROGRAMMING
(OPEN ELECTEIVE-II)

B. Tech (ECE)

L	**T**	**P**	**C**
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.)

(A402603) ELECTRIC VEHICLE TECHNOLOGY
(OPEN ELECTIVE-II)

	L	T	P	C
B. Tech (ECE)	**3**	**0**	**0**	**3**

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

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 in Hybrid 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)

	L	T	P	C
B. Tech (ECE)	3	0	0	3

Course Objectives:
To provide an overview of power plants and the associated energy conversion issues

Course Outcomes: Upon completion of the course, the students can understand the principles of operation for different power plants and their economics

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

6. Understand the layout of and various components of Coal Based Thermal Power Plants
7. Understand the operation of Gas Turbine and Combined Cycle Power Plants
8. Illustrate the Nuclear Energy Conversion system
9. Explain the operation and Classification, typical layout and components of Hydroelectric Power Plants
10. Understand the different parameters associated with Energy, Economic and Environmental Issues

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

(A403603) FUNDAMENTALS OF MANUFACTURING PROCESSES
(Open Elective: II)

B. Tech (ECE)

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.

(A403604) FUNDAMENTALS OF AUTOMOBILE ENGINEERING
(Open Elective: II)

B. Tech (ECE)

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.

(A401603) REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEMS
(Open Elective: II)

B.Tech (ECE)
                                                                        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

COURSE OUTCOMES: On completion of the course students will be able to

1. illustrate the principles of photogrammetry
2. make use of remote sensing process
3. utilize GIS principles in real life
4. explain the concepts of topology, OBVDM and tomography
5. develop the geospatial data model with various file formats

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

(A401604) SOLID WASTE MANAGEMENT
(Open Elective-II)

B.Tech (ECE)   **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; Pyrolysis, 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, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 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.

COURSE OUTCOMES: On completion of the course students will be able to

1. explain the sources of solid waste and its impact
2. describe the process of solid waste and its management
3. illustrate the process of handling hazardous wastes
4. classify various biomedical waste management systems
5. apply e-waste management techniques

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

(A400603) ENTREPRENEURSHIP
(Open Elective-II)

B. Tech (ECE)

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- Stress and 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, Excel Books, 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.

(A400604) ETHICS IN BUSINESS & CORPORATE GOVERNANCE
(Open Elective-II)

B. Tech (ECE)

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. K. 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.

(A462602) CLOUD COMPUTING
(Open Elective-II)

B.Tech.(ECE)

L T P C
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, Managing the 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

TEXT BOOK:
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

(A467802) LINUX PROGRAMMING
(OPEN ELECTEIVE-II)

	L	**T**	**P**	**C**
B. Tech (ECE)	**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, file 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, fields and records, scripts, operation, patterns, actions, associative arrays, string and mathematical functions, system commands in awk, applications.

Unit II: Working with The Bourne 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 in shell, interrupt processing, functions, and debugging scripts;

Unit III: Handle Files and Directories

File structure and directories: Introduction to file system, file descriptors, file types, file system structure; File metadata: Inodes; 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, Advanced Programming in the UNIX Environment, Pearson Education, 1st Edition,2005.
2. Sumitabha Das, Unix Concepts and Applications, Tata McGraw-Hill, 4th Edition,2006.
3. Neil Mathew, Richard Stones, Beginning Linux Programming, Wrox, Wiley India, 4th Edition, 2011.

Reference Textbooks
1. Sumitabha Das, Your Unix the Ultimate Guide, Tata McGraw-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 and Shell Programming, CengageLearning,3rd Edition, 2005.

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

B. Tech (ECE)

L	T	P	C
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 Ethem Alpaydin, 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.

(A404605) FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective-III)

B.Tech-ECE

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. Summarize 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

	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. ECE

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, Second edition 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.

	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

(A405603) FUNDAMENTALS OF COMPUTER NETWORKS
(OPEN ELECTEIVE-III)

	L	**T**	**P**	**C**
B. Tech (ECE)	**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.

(A405606) DEVOPS
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech (ECE)	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 development Deployment 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

(A402605) NANO TECHNOLOGY
(OPEN ELECTIVE-III)

B. Tech (ECE)

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

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

(A402604) EV BATTERIES & CHARGING SYSTEM
(OPEN ELECTIVE-III)

B. Tech (ECE)	L	T	P	C
	3	0	0	3

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

(A403605) INDUSTRIAL SAFETY ENGINEERING
(Open Elective: III)

B. Tech (ECE)

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.

(A403606) WASTE TO ENERGY
(Open Elective: III)

B. Tech (ECE)

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.

(A401605) ENERGY EFFICIENT BUILDINGS
(Open Elective-III)

B.Tech (ECE)

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 shading devices, 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 heat transfer; 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 through landscape 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 Modeling and 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. Majumder Milli, Energy Efficient Buildings, TERI, New Delhi.

COURSE OUTCOMES: On completion of the course students will be able to

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

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

(A401606) ENVIRONMENTAL POLLUTION
(Open Elective-III)

B.Tech (ECE)   **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. J. 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 Hall of India
2. M. N. Rao and H. V. N. Rao, "Air pollution", Tata Mc.Graw Hill Company. Ruth F. "Weiner andRobin Matthews Environmental Engineering", 4thEdition Elesevier, 2003.
3. K. V. S. G. Murali Krishna, "Air Pollution and Control"by, Kousal & Co. Publications, New Delhi.

COURSE OUTCOMES: On completion of the course students will be able to

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

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

(A400605) BASICS OF MARKETING
(Open Elective-III)

B.Tech (ECE)

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:
- 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, Oxford University 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 Asia edition,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 present Global Market Environment.
2. Outline marketing research, consumer behaviour, segmentation and targeting.
3. Develop conceptual knowledge on new product development, marketing mix and promotional mix
4. Illustrate marketing channels of distribution and logistics
5. Identify the skills and importance of sales management

(A400606) INTELLECTUAL PROPERTY RIGHTS
(Open Elective-III)

B.Tech (ECE)

L	T	P	C
3	0	0	3

Course Objectives:
1. To understand fundamental concepts of intellectual property rights
2. To Gain knowledge on development and owning of Trade Marks, Copy Rights, and Patents.
3. To describe various laws of copy rights.
4. To enlighten students the significance of trade secrets.
5. To gain kknowledge on new development of intellectual property.

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, Tata Mc 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.

(A462602) CYBER LAWS AND ETHICS
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech (ECE)	**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 about Intellectual property rights.
5. To know about cyber laws.

(A467803) BUSINESS INTELLIGENCE
(OPEN ELECTEIVE-III)

	L	T	P	C
B. Tech (ECE)	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 different BI-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 with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQL Server, 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.

A466603) ARTIFICIAL NEURAL NETWORKS
(OPEN ELECTEIVE-III)

B. Tech (ECE)

L	T	P	C
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:
- Create different neural networks of various architectures both feeds forward and feed backward.
- Perform the training of neural networks using various learning rules.
- Perform the testing of neural networks and do the perform analysis of these networks.
  for various pattern recognition applications.