School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Credit Definition

Type	Duration (in Hour)	Credit
Lecture (L)	1	1
Tutorial (T)	1	1
Practical (P)	2	1

Total Credit

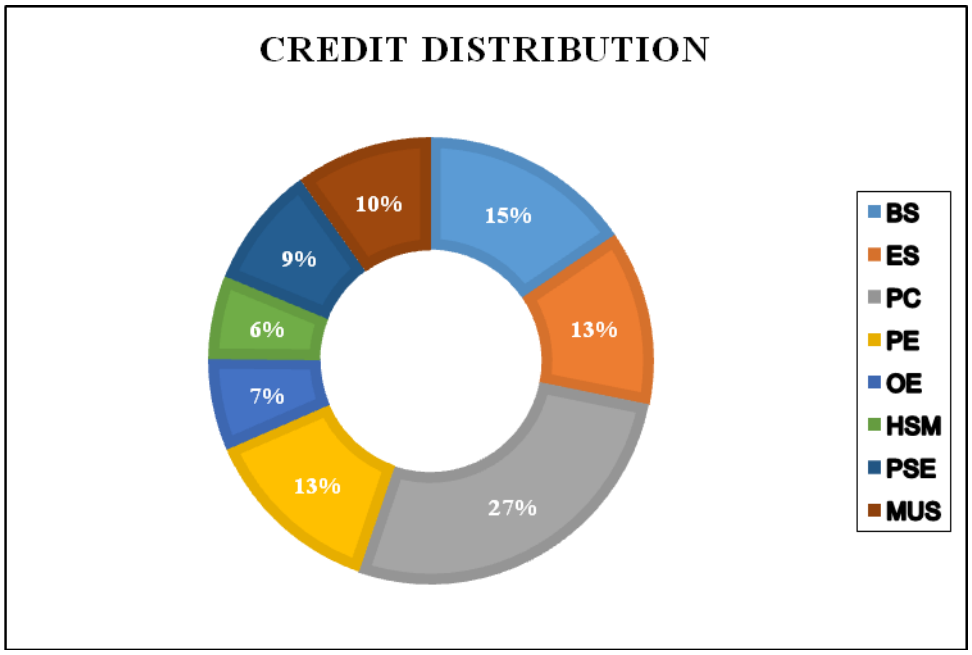
Year	Semester	hrs./Week	Credit
1st	1st	31	25
	2nd	31	25
2nd	3rd	27	23
	4th	28	23
3rd	5th	25	21
	6th	24	21
4th	7th	21	17
	8th	19	17
Total			**172**

Category Codification with Credit Break up

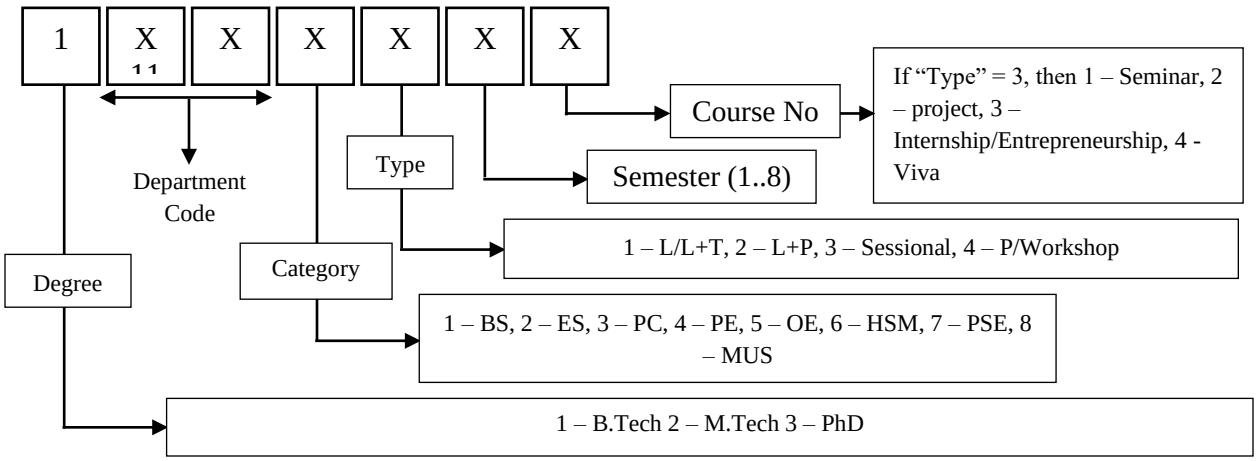
Definition of Category	Code	No	Credit
Basic Science	BS	1	21
Engineering Science	ES	2	32
Professional Core	PC	3	48
Professional Elective (Discipline Specific)	PE	4	21
Open Elective (General Elective)	OE	5	12
Humanities & Social Science including Management	HSM	6	7
Project Work / Seminar / Internship / Entrepreneurship	PSE	7	19
Mandatory / University Specified (Environmental Sc. / Induction Training / Indian Constitution / Foreign language)	MUS	8	12
Total			**172**

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Category wise Credit Distribution



Subject Codification



School of Engineering & Technology
B. Tech Electronics and Communication Engineering

SEMESTER: I

Mandatory Induction Program – Duration 3 weeks

- Physical Activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent People
- Visits to Local Areas
- Familiarization to Department/Branch & Innovations

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Engineering Mathematics – I	BS	1191111	3	3	0	0
2	Engineering Physics	BS	1171112	3	3	0	0
3	Fundamentals of Computer Sc. & Problem Solving using C	ES	1112112	4	3	1	0
4	Principles of Electrical Engineering	ES	1132113	3	3	0	0
5	Communicative English - I	HSM	1216111	2	2	0	0
6	Environmental Science	MUS	1158111	2	2	0	0
7	Engineering Physics Lab	BS	1171212	1	0	0	2
8	Engineering Drawing Lab	ES	1102211	2	0	0	4
9	Fundamentals of Computer Sc. & Problem Solving Lab	ES	1112212	2	0	0	4
10	Principles of Electrical Engineering Lab	ES	1132213	1	0	0	2
11	Foreign Language - I - Spanish	MUS	1278111	2	2	0	0
	Foreign Language - I - German	MUS	1278112				
	Foreign Language - I - Japanese	MUS	1278113				
	Foreign Language - I - French	MUS	1278114				
	Total Credit (BS-7, ES-12, HSM-2, MUS-4)			25	31 Hrs./Week		

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

1. Engineering Mathematics - I

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Engineering Mathematics – I	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Mathematics	**CATEGORY:** BS
CODE: 1191111	**SEMESTER:** First
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Differential Calculus: Functions of one variable Rolle‟s theorem, Mean value theorem, Taylor series expansion, concavity and convexity of a curve, points of inflexion, asymptotes and curvature, curve tracing.

Function of several variables: Limit, continuity and differentiability of functions of several variables, partial derivatives and their Geometrical interpretation, differential, derivatives of composite and implicit functions, derivatives of higher order and their commutatively, Euler‟s theorem on homogeneous function, harmonic functions, Taylor‟s expansion of functions of several variables, Maxima and Minima of functions of several variables- Lagrange‟s method of multipliers.

Integral Calculus: Review of integration and definite integral. Definite integral as the limit of sum, applications of definite integrals, double and triple integral, area under plane curve, improper integral.

Differential Equations: Order, degree, formation of differential equation, First order differential equation – exact, linear and Bernoulli‟s form, second order differential equations with constant coefficients, method of variation of parameters, general linear differential equations with constant coefficients, Euler‟s equations, system of differential equations. Applications.

Sequences and Series: Sequences and their limits, convergence of series, comparison test, Ratio test, Root test, Absolute and conditional convergence, alternating series, Power series.

Text Books:

1. Higher Algebra, S. K. Mapa, Levant Books.
2. Advanced Higher Algebra, Chakravorty and Ghosh, U N Dhar Pvt. Ltd.ISBN 97893806736
3. Integral Calculus including Differential Equations, Das and Mukherjee, U N Dhar Pvt. Ltd.ISBN: 978- 9380673882

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

4. Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd. ISBN:9789380673448.

Reference Books:

5. Advanced Engineering Mathematics, E Kreyszig, Wiley
6. Ghosh and Maity, An Introduction to Analysis: Differential Calculus, New Central Book Agency, 2011, ISBN: 9788173812026
7. G.F. Simmons, Differential Equations with applications and Historical Notes, CRC Press ISBN: 978-1- 4987-0259-1
8. M.D. Raisinghania, Ordinary and Partial Differential Equation, S. Chand and Company, 2006 ISBN 81- 219-0892-2
9. Schaum's Outline of Differential Equations, 4th Edition (Schaum's Outlines) by Richard Bronson and Gabriel Costa.

2. Engineering Physics

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Engineering Physics	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Physics	**CATEGORY:** BS
CODE: 1171112	**SEMESTER:** First
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Oscillation and fundamental of wave optics: Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple springs mass system. Resonance-definition., damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators.

Interference-principle of superposition-young's experiment: Theory of interference fringes-types of Interference-Fresnel"s Prism-Newton"s rings, Diffraction-Two kinds of Diffraction-Difference between interference and Diffraction-Fresnel"s half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence.

Basic Idea of Electromagnetisms, Maxwell's Equations: Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster"s law, double refraction.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Quantum Mechanics and Crystallography: Introduction - Planck‟s quantum theory- Matter waves, de-Broglie wavelength, Heisenberg‟s Uncertainty principle, time independent and time dependent Schrödinger‟s wave equation, Physical significance of wave function, Particle in a one dimensional potential box, Heisenberg Picture. Crystallography - Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, Debye Scherrer powder method, laue method- Atomic packing factor for SC, BCC, FCC and HCP structures. Semiconductor Physics - conductor, semiconductor and Insulator; Basic concept of Band theory.

Laser and Fiber optics: Einstein‟s theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO2 and Neodymium lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers.

Thermodynamics: Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Engine, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

Laboratory

1) Magnetic field along the axis of current carrying coil – Stewart and Gee
2) Determination of Hall coefficient of semi-conductor
3) Determination of Plank constant
4) Determination of wave length of light by Laser diffraction method
5) Determination of wave length of light by Newton‟s Ring method
6) Determination of laser and optical fiber parameters
7) Determination of Stefan‟s Constant.

Text Books:

1. Beiser A, “Concepts of Modern Physics”, Fifth Edition, McGraw Hill International.
2. David Halliday, Robert Resnick, Jearl Walker, “Fundamentals of Physics”, Wileyplus.

Reference Books:

3. Ajoy Ghatak, “Optics” Fifth Edition, Tata McGraw Hill.
4. Sears &Zemansky, “University Physics”, Addison-Wesley.
5. Jenkins and White, “Fundamentals of Optics”, Third Edition, McGraw-Hill.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

---

3. Engineering Drawing

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Engineering Drawing	**COURSE CREDIT :** 02 [2-0-0]
DEPARTMENT: Mechanical Engineering	**CATEGORY:** ES
CODE: 1102111	**SEMESTER:** First
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction to Technical Drawing Standard: Technical Drawing, ISO Standard, Paper Size, Lay out, Line, Scale, Title Block, Application of lines, drawing folding, view, projection, auxiliary view.

Section and Dimension: Section and hatch, type of hatch. Coordinate and dimension, Chain dimension, Parallel dimension, Combined dimension, Coordinates dimension, Chord, Arc, Angle, Chamfer, Countersink, Dimension of Cylinder part, cubical part, sheet metal part.

Tolerance: Classification of tolerance, Linear tolerance, Angular Tolerance, Special tolerance. • Tolerance indication. Bilateral and Unilateral tolerance, tolerance and fit, geometrical tolerance.

Parts, Welding and Assembly: Introduction standard parts, part drawing. Introduction to welding, welding symbols and indication to drawing, assembly drawing.

Text Books:

1. "Technical Drawing", Authors: Giesecke, Mitchell, Spencer, Hill, Dygdon, Novak, Publisher: Pearson, Prentice Hall, ISBN:0-13-178446-3
2. "Technical Drawing", Publisher: ISO Standard Handbook, ISBN: 178446 – 3

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

---

4. Fundamentals of Computer Science & Problem Solving

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Fundamentals of Computer Science & Problem Solving	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Computer Sc. & Engg.	**CATEGORY:** ES
CODE: 1112112	**SEMESTER:** First
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.

Number Systems: Binary, Octal, Decimal, and Hexadecimal.

Problem Solving approach: Algorithm, structure of algorithm, running time, formulate simple algorithm for arithmetic and logical problems.

Imperative languages: Introduction to python programming language; syntax and constructs of a specific language.

Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes, Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation.

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else statement, Loops: while, do-while, for. Concept of break, continue and pass statement.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, Block structure, Initialization, Recursion and return types. Concept of module and packages.

Basic concepts of tuple, list, dictionary and string. Linear and Binary Search, Selection and

Bubble Sort. File handling using python.

Laboratory:

1. Algorithm and flowcharts of small problems like GCD
    i. Structured code writing with: Small but tricky codes
    ii. Proper parameter passing
    iii. Command line Arguments
    iv. Variable parameter
    v. Make file utility
    vi. Multi module program

Text Books:

1. Harsh Bhasin, “Python for Beginners”, Second Edition.
2. Mark Lutz, “Learning Python”, FifthEdition, O Reilly.

Reference Books:

3. Brown Martin C, “Python: The Complete Reference”, McGraw Hill.
4. David M. Beazley, “Python Essential reference”, third edition, Sams publishing.

5. Principles of Electrical Engineering

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Principles of Electrical Engineering	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electrical Engineering	**CATEGORY:** ES
CODE: 1132113	**SEMESTER:** First
PRE-REQUISITE (If Any):	

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

SYLLABUS OUTLINE:

Introduction and overviews: Electron Devices, Circuits and Systems, Integrated Circuits, Analog and digital signals

Basic Concepts and Circuit Analysis: Concept of Potential difference, voltage, current, Fundamental linear passive and active elements to their functional current-voltage relation, Terminology and symbols in order to describe electric networks, Concept of work, power, energy and conversion of energy. DC Circuits-Current- voltage relations of electric network by mathematical equations to analysis the network (Thevenin‟s theorem, Norton‟s Theorem, Maximum Power Transfer theorem) voltage source and current sources, ideal and practical, Kirchhoff‟s laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem. AC Circuits-AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3 phase Balanced AC Circuits.

Principle of Electro-mechanics and Electrostatics: Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of

capacitors, Principle of batteries, types, construction and application.

Electro-mechanics: Electricity and Magnetism, magnetic field and faraday‟s law, self and mutual inductance, Ampere‟s law, Magnetic circuit, Magnetic material and B-H Curve, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, KVA rating, efficiency and regulation, Electromechanical energy conversion, Basic concept of indicating and integrating instruments.

Measurements and Sensors: Introduction to measuring devices/sensors and transducers related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems and their practical application.

Electrical Wiring and Illumination system: Basic layout of distribution system, Types of Wiring System &Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED)

Laboratory

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits
2. Determination of resistance temperature coefficient

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

3. Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power Transfer theorem)
4. Simulation of R-L-C series circuits for XL> XC , XL< XC & XL= XC
5. Simulation of Time response of RC circuit
6. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
7. Demonstration of measurement of electrical quantities in DC and AC systems.

Text Books:

1. A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, "Electric Machinery", Sixth Edition Tata McGraw Hill.
2. B. L.Theraja, "A Textbook of Electrical Technology", vol. I, S. Chand and Company Ltd., New Delhi.
3. V. K. Mehta, "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi.
4. J. Nagrath and Kothari, "Theory and problems of Basic Electrical Engineering", Second Edition Prentice Hall of India Pvt. Ltd.

Reference Books:

5. Edward Hughes, "Electrical Technology", Tenth Edition, Pearson Education Publication.
6. Vincent. Del. Toro, "Electrical Engineering Fundamentals", Second Edition, Prentice Hall India.
7. Sudhakar Shyammohan, "Circuits and Networks: Analysis and Synthesis", Fifth Edition Tata McGraw Hill Education.

6. Communicative English – I

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Communicative English - I	**COURSE CREDIT :** 02 [2-0-0]
DEPARTMENT: English	**CATEGORY:** HSM
CODE: 1216111	**SEMESTER:** First
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Grammar:
Noun and Pronoun (Types and Functions), Verbs (Lexical and Auxiliary), Verb Tenses, Adjectives and Adverb, Article and Preposition, Conjunction, Phrases, Clause (Noun, Adjective, Adverb), Sentence Types (Simple, Compound and Complex), Transformations (Active-Passive, Direct-Indirect)

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Vocabulary:

One-word Substitution, Homophones, Proverbs, Synonyms and Antonyms

Phonetics:

Air-stream Mechanism, Vowel and Consonant Sounds, Intonation

Communication Theory:

Definition of Communication, Types of Communication (Verbal & Non-Verbal; Formal & Informal; Intra- personal, Inter-personal, Extra-personal, Group, Mass), Flows of Communication (Vertical, Horizontal and Diagonal), Barriers of Communication

Comprehension:

Reading and Comprehension, Objective and Subjective Questions.

Text Books:

1. Intermediate English Grammar- Cambridge University Press
2. High School English Grammar- Wren and Martin

Reference Books:

3. English vocabulary in use – Alan Mc"carthy and 0"dell
4. APAART: Speak Well 1 (English language and communication)
5. APAART: Speak Well 2 (Soft Skills)

7. Environmental Science

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Environmental Science	**COURSE CREDIT :** 02 [2-0-0]
DEPARTMENT: Chemistry	**CATEGORY:** MUS
CODE: 1158111	**SEMESTER:** First
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Introduction: Definition, principles and scope of Environmental Science, Earth, Man and Environment. Ecosystems, Pathways in Ecosystems. Physico-chemical and Biological factors in the Environment, Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Mass and Energy transfer across the various interfaces, material balance. Atmospheric stability, Natural resources, conservation and sustainable development.

Fundamentals of Environmental Chemistry: Stochiometry, Gibbs‟ energy, Chemical potential, Chemical equilibria, acid base reactions, solubility product, solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, radionuclides.

Chemical composition of Air: Classification of elements, chemical speciation. Particles, ions and radicals in the atmosphere. Chemical processes for formation of inorganic and organic particulate matter. Thermochemical and photochemical reactions in the atmosphere. Oxygen and ozone chemistry. Chemistry of air pollutants, Photochemical smog.

Ecosystem: Structure and functions, Abiotic and Biotic components, energy flows, Food Chains, Food web, Ecological pyramids, types and diversity. Ecological Succession, Population, Community ecology and Parasitism, Preypredator relationships.

Mineral Resources and Environment: Resources and Reserves, Minerals and Population. Oceans as new areas for exploration of mineral resources. Ocean ore and recycling of resources. Environmental impact of exploitation, processing and smelting of minerals.

Water Resources and Environment: Global Water Balance. Ice Sheets and fluctuations of sea levels. Origin and composition of seawater. Hydrological cycle. Factors influencing the surface water. Types of water. Resources of oceans. Ocean pollution by toxic wastes. Human use of surface and groundwater. Groundwater pollution.

Text Book:

1. Environmental Science, Miller T.G. Jr., Wadsworth Publishing Co.
2. Environmental Biology, Agarwal, K.C. 2001, Nidi Publ. Ltd.

Reference Books:

3. The Biodiversity of India, Bharucha Erach, Mapin Publishing Pvt. Ltd.
4. Environmental Chemistry, De A.K, Wiley Eastern Ltd.
5. Environmental Science systems & Solutions, Mckinney, M.L. & School, R.M. 1996

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

SEMESTER: II

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Engineering Mathematics – II	BS	1191121	3	3	0	0
2	Engineering Chemistry	BS	1161122	3	3	0	0
3	Principles of Computer Programming	ES	1112122	4	3	1	0
4	Basic Electronics	ES	1122123	3	3	0	0
5	Biology for Engineers	BS	1151123	2	2	0	0
6	Communicative English - II	HSM	1216121	2	2	0	0
7	Engineering Chemistry Lab	BS	1161222	1	0	0	2
8	Introduction to Manufacturing Processes Lab	ES	1102221	2	0	0	4
9	Principles of Computer Programming Lab	ES	1112222	2	0	0	4
10	Basic Electronics Lab	ES	1122223	1	0	0	2
11	Foreign Language - II - Spanish	MUS	1278121	2	2	0	0
	Foreign Language - II - German	MUS	1278122				
	Foreign Language - II - Japanese	MUS	1278123				
	Foreign Language - II - French	MUS	1278124				
	Total Credit (BS-9, ES-12, HSM-2,MUS-2)			25	31 Hrs./Week		

1. Engineering Mathematics - II

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Engineering Mathematics – II	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Mathematics	**CATEGORY:** BS
CODE: 1191121	**SEMESTER:** Second
PRE-REQUISITE (If Any): Mathematics-I	

SYLLABUS OUTLINE:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Algebraic Structures: Sets, algebra of sets and their applications, Relations, Mapping, Groups, Abelian groups, Subgroups, Cyclic groups, Permutation group, Definition of Ring, Field and simple related problems.

Graph Theory: Graphs, Digraphs, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Sub graph, Walks, Paths, Circuits, Euler Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph. Eulers formula (n - e + r = 2) for connected planar graph and its generalisation for graphs with connected components. Detection of planarity. Graph colouring. Chromatic numbers of Cn, Kn, Km,n and other simple graphs. Simple applications of chromatic numbers.

Tree: Definition and properties, Binary tree, Spanning tree of a graph, Minimum spanning tree, properties of trees, Algorithms: Dijkstra‟s Algorithm for shortest path problem, Determination of minimal spanning tree using Kruskal‟s and Prim‟s algorithms.

Propositional Calculus: Proposition, propositional variables, combination of propositions ,Conjunction, Disjunction, Negation and their truth table, derived connectors. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Bi conditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF; Predicates and Logical Quantifications of propositions and related examples.

Counting Techniques: Permutations, Combinations, Binomial coefficients, Pigeon-hole Principle, Principles of inclusion and exclusions; Generating functions, Recurrence Relations and their solutions using generating function, Recurrence relation of Fibonacci numbers and it‟s solution, Divide-and-Conquer algorithm and its recurrence relation and its simple application in computer.

Boolean Algebra and Combinatorial Circuits: Definition, Sub-Algebra, Isomorphic Boolean Algebra, Boolean functions and expressions, DNF and CNF, principle of duality, design of digital circuits, Applications of Boolean algebra in switching theory, series and parallel connections, Karnaugh Maps, minimization of Boolean expression using k-map.

Text Books:

1. Higher Algebra, S. K. Mapa, Levant Books.
2. N. Deo, Graph Theory with applications to Engineering and Computer Science Prentice Hall Of India, 2007, ISBN: 978-81-203-0145-0
3. S. Pal and S.C. Bhunia, Engineering Mathematics, Oxford University Press, 2015, ISBN 978-0-19-807089-4

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

4.S. K. Sarkar, A text book of Discrete Mathematics, S. Chand & Company Ltd., 2006. ISBN : 81-219-2232-1

Reference Books:

5. S. B. Gupta, Discrete Mathematics and Structures , Laxmi Publications(P) Ltd., 2007 ISBN: 81-7008-918-2
6. D. S. Malik and M.K. Sen, Discrete Mathematics Theory and Applications (Revised Addition), Cengage Learning, 2017, ISBN: 978-81-315-1866-3
7. Advanced Engineering Mathematics - Erwin Kreyszig is published by Wiley India
8. D. Poole, Linear Algebra –A Modern Introduction, CENGAGE Learning, 2015 ISBN: 978-81-315-30245

2. Engineering Chemistry

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Engineering Chemistry	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Chemistry	**CATEGORY:** BS
CODE: 1161122	**SEMESTER:** Second
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Thermodynamics of Chemical Processes: Concept of entropy, Chemical potential, Equilibrium conditions for closed systems, Phase and reaction equilibria, Maxwell relations, Real gas and real solution.

Electrochemical Systems: Electrochemical cells and EMF, Applications of EMF measurements: Thermodynamic data, activity coefficients, solubility product and pH, corrosion.

Kinetics of Chemical Reactions: Reversible, consecutive and parallel reactions, Steady state approximation, Chain reactions, Photochemical kinetics.

Bonding Models in Inorganic Chemistry: Molecular orbital theory, Valence-bond theory, Crystal field theory.

Fundamentals of Microwave, IR and UV-VIS Spectroscopy: Basic concepts of spectroscopy, Selection rule, Determination of molecular structure.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Coordination Chemistry: Coordination numbers, Chelate effect, Coordination complexes and application, Bio-inorganic chemistry: Metal ions in Biological systems, environmental aspects of Metals, NOx, CO, CO2.

Organic Reaction Mechanism: Mechanisms of selected organic, bio-organic, polymerization and catalytic reactions. Stereochemistry of Carbon Compounds: Selected Organic Compounds: Natural products and Biomolecules (Amino acids/nucleic acids/proteins).

Laboratory Component: Surface tension and parachor, Measurement of the coefficient of viscosity: CMC of a surfactant, Conductometric titration, pH-metric/potentiometric titration, Solubility product, Kinetics of ester hydrolysis, Estimation of Fe2+, EDTA titration, Estimation of base content and acid content of commercially available antacid and vitamin C respectively, Synthesis of Mohr‟s salt, Synthesis of aspirin, Demonstration of a few important physico-chemical processes. (e.g. Gel electrophoresis, Oscillatory reactions)

Text Books:

1. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell

Reference Books:

4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, M. S. Krishnan
5. Physical Chemistry, P. C. Rakshit, Sarat Book House

3. Introduction to Manufacturing

Processes COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Workshop / Manufacturing Practices	**COURSE CREDIT :** 02 [2-0-0]
DEPARTMENT: Physics	**CATEGORY:** ES
CODE: 1102121	**SEMESTER:** Second
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Theory Component: Basic concepts and principles of manufacturing, Performing Processes: Casting, forging, rolling, drawing, extrusion, press tool work, plastic moulding and powder metallurgy, Joining

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Processes: Welding, brazing and crimping, Semi-finishing and finishing processes: Machining (Turning, shaping, drilling, Milling and grinding), Non-traditional Processes: Abrasive jet machining, Ultrasonic machining, Electro- discharge machining, Electrochemical machining and laser beam machining, Product Quality: Possible defects and their detection, assessment and remedy.

Laboratory Component: Suggested Assignments: Introducing to various machine tools and demonstration on machining, Making a steel pin as per drawing by machining in centre lathe, External screw thread by single point chasing in lathe, Making a cast iron Vee block by shaping, Making a regular polygon prism (MS) by milling, Making a gauge as per drawing, Study of machining in machining in machining centre (CNC) and Electro discharge machining (EDM), Orientation, demonstration and practice on metal casting, Practicing sand moulding using split and uneven parting line pattern, Practice on CO2 moulding and machine moulding, Mechanised sand preparation and melting practice, Practice on Oxy-acetylene gas welding and manual metal arc welding (running bead), Practice on oxy-acetylene gas cutting and arc welding for butt welding, Introduction and demonstration on submerged arc welding and plasma spray coating, Demonstration of deep drawing process.

Reference Books:

1. Elements of Workshop Technology, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, Media promoters and publishers, Mumbai.
2. Manufacturing Engineering and Technology, Kalpakjian S. and Steven S. PEI India Edition.
3. Manufacturing Technology, G. P. Hariharan and A. Suresh, Pearson Education, 2008.
4. Processes and Materials of Manufacture, Roy A. Lindberg, Prentice Hall India, 1998.
5. Manufacturing Technology, Rao P.N, TMG

4. Principles of Computer Programming

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Principles of Computer Programming	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Computer Sc. & Engg.	**CATEGORY:** ES
CODE: 1112122	**SEMESTER:** Second
PRE-REQUISITE (If Any): Fundamental of Computer Sc. & Problem solving	

SYLLABUS OUTLINE:

Imperative languages: Introduction to imperative language; syntax and constructs of a specific language (ANSI C):

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Types Operator and Expressions with discussion of variable naming and Hungarian Notation: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un-structured programming

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Preprocessor, Standard Library Functions and return types.

Pointers and Arrays: Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Arithmetic, character Pointers and functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialization of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

Input and Output: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions

Storage Class: Different type of Storage Classes, automatic, register, static and external. Local variable and global variable, scope and rules. Static and automatic storage in global variable. Accessing through several functions. Simple program using recursions.

Structures and Unions: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields.

Dynamic Memory allocation: Memory allocation functions such as malloc(), calloc(), free(), realloc(). Define linked list in terms of dynamic memory allocation, different operations such as insert, delete, and traversal. Implementation of circular linked list.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

File handling: File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access

– seek, Discussions on Listing Directory, Storage allocator.

Laboratory:

1. Algorithm for complex problem
2. Structured code writing with:
    i. Array on different dimension
    ii. Pointer handling
    iii. Pointer vs array
    iv. Pointer to functions
    v. Define structure
    vi. User defined header
    vii. Make file utility
    viii. Multi file program and user defined libraries
    ix. Linked list
    x. Recursion

Text Books:

1. B. W. Kernighan and D. M. Ritchi, "The C Programming Language", Second Edition, PHI.
2. B. Gottfried, "Programming in C", Second Edition, Schaum Outline Series.

Reference Books:

3. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
4. Reema Theraja, "Programming in C", Oxford University press.

5. Principles of Electronics Engineering

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Principles of Electronics Engineering	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** ES
CODE: 1122123	**SEMESTER:** Second
PRE-REQUISITE (If Any):	

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

SYLLABUS OUTLINE:

Semiconductors: Crystalline material and their properties, Energy band theory, Fermi levels; Conductors, Semiconductors and Insulators: electrical properties, band diagrams. Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers. [4]

Diodes and Diode Circuits: Formation of P-N junction, energy band diagram, built-in-potential forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave. [5]

Bipolar Junction Transistors: Device structure and physical operation, current – voltage characteristics, the BJT as an amplifier and a switch, Biasing BJT Amplifier Circuits, Single stage BJT amplifiers CE, CB, CC. [4]

Field Effect Transistors: Device structure and physical operation, current – voltage characteristics, JFET & MOSFET Structure and characteristics; MOSFET as an amplifier and a switch, Biasing MOSFET Amplifier Circuits, Single stage MOS amplifiers Amplifier Configuration, Common Source, Source Follower, Common Gate Configuration. [5]

Basic gates and Boolean algebra: minimum forms of switching functions, two and three variable Karnaugh maps, four variable karnaugh maps, determination of minimum expressions using essential prime implicants, Quine-McClusky Method: determination of prime implicants [4]

.

Combinational circuit design: Adder, Subtractor, Multiplexer, Decoder [5]

Programmable Logic Devices: PLD, PLA [3]

Sequential Circuits: Flip/Flop, Register, Counter [6]

Text Books:

1.Salivahanan: “Digital Electronics”, Tata McGraw-Hill Education, 3rd Edition 2012

2. JB Gupta: “Electronic devices and circuits”, S K KATARIA & SONS, 1st edition, 2012

3. Rakshit Chattopadhyay: “Electronics Fundamentals and Applications”, 11th Edition, 2010

4. Boylestad & Nashelsky : “Electronic Devices & Circuit Theory”, Pearson, 11th Edition, 2015

5.Charles H Roth and Larry L Kinney, Analog and Digital Electronics, Cengage Learning,2019.

References Books:

1. Anil K Maini, Varsha Agarwal, Electronic Devices and Circuits, Wiley, 2012.
2. Donald P Leach, Albert Paul Malvino & Goutam Saha, Digital Principles and Applications, 8th Edition, Tata McGraw Hill, 2015.
3. M. Morris Mani, Digital Design, 4th Edition, Pearson Prentice Hall, 2008.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

4. David A. Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 2008.

6. Biology for Engineers

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Biology for Engineers	**COURSE CREDIT :** 02 [2-0-0]
DEPARTMENT: Biological Science	**CATEGORY:** BS
CODE: 1151123	**SEMESTER:** Second
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction: The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. Classification: (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification.

Genetics Purpose: Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in human and human genetics genetics.

Biomolecules Purpose: Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids. AICTE Model Curriculum for Undergraduate degree in Civil Engineering (Engineering & Technology).

Enzymes Purpose: Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Information Transfer Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Macromolecular analysis Purpose: How to analyses biological processes at the reductionistic level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Metabolism Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions.

Microbiology Concept: Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms.

Text Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.

Reference Books:

4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers.

7. Communicative English – II

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Communicative English - II	**COURSE CREDIT :** 02 [2-0-0]
DEPARTMENT: English	**CATEGORY:** HSM
CODE: 1216121	**SEMESTER:** Second
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Grammar:

Verbs- Gerund, Participle, Infinitives, Modal Verbs; Adjectives- Degree of Comparison, Transformation (Positive, Comparative, Superlative); Moods - Declarative, Imperative, Exclamatory, Interrogative, Subjunctive, Optative, Conditional; Prepositions- Simple, Compound, Phrase

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Vocabulary:

One-word Substitution, Homophones, Figures of Speech (simile, metaphor), Business Idioms

Communication Theory:
Audience Analysis, 7 Cs of Communication, SWOT Analysis

Comprehension:

1. Reading and Comprehension, Objective and Subjective Questions
2. Understanding Visual Data- Graphs, Charts, Tables

Writing:

Business Letters- Application, Complaints, Order, Collection, Sales Promotional Letter; Notice, Memorandum, Agenda, Minutes, Advertisements.

Text Books

1. High School English Grammar by Wren and Martin
2. Developing Communication Skills by Krishna Mohan and Meera Banerji

Reference Books:

3. Technical Communication- Meenakshi Raman and Sangeeta Sharma
4. Professional Communication by Ashraf Rizvi

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

SEMESTER: III

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Electronic Devices	PC	1123131	3	3	0	0
2	Digital System Design	PC	1123132	3	3	0	0
3	Network Theory	PC	1123133	3	3	0	0
4	Signal & System	PC	1123134	3	3	0	0
5	Engineering Mathematics III	BS	1191131	2	2	0	0
6	Data Structure & Algorithm	ES	1112131	3	3	0	0
7	Mentored Seminar – I	PSE	1127331	1	0	0	2
8	Data Structure & Algorithm Lab	ES	1112231	1	0	0	2
9	Digital System Design Lab	PC	1123231	1	0	0	2
10	Electronic Devices Lab	PC	1123232	1	0	0	2
11	Foreign Language - III - Spanish	MUS	1278131	2	2	0	0
	Foreign Language - III - German	MUS	1278132				
	Foreign Language - III - Japanese	MUS	1278133				
	Foreign Language - III - French	MUS	1278134				
	Total Credit (PC-14, BS-2. ES-4,PSE-1,MUS-2)			23	27 Hrs./Week		

Electronic Devices:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Electronic Devices	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123131	**SEMESTER:** Third
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, Kronig-Penny model, E-k diagrams, Direct and indirect band gap semiconductors. Energy bands in intrinsic and extrinsic silicon. [8]

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

2. Electron transport in semiconductors: Generation and recombination of carriers, Poisson and continuity equation, Carrier transport; diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors. [5]

3. Junction Diodes: P-N junction characteristics; Concept of Depletion layer, Junction capacitance, I-V characteristics, Small signal and switching models; Breakdown mechanisms in p-n junctions; Avalanche breakdown, Zener breakdown, Zener diode as Voltage reference. [6]

4. Bipolar Junction Transistor: I-V characteristics, Small signal models; Ebers-Moll Model, Hybrid-π model, High frequency model. [5]

5. Metal Oxide Semiconductor Field Effect Transistor (MOSFET): MOS capacitor, C-V characteristics; MOSFET, I-V characteristics, Small signal models of MOS transistors. [6]

6. Special purpose diodes: Schottky diode, LED, photodiode and solar cell. [3]

7. Integrated circuit fabrication process: Oxidation, diffusion, ion implantation, photolithography, etching, physical vapour deposition, chemical vapor deposition, typical integrated circuit process flow. [3]

Text /Reference Books:
1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson, 2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc, 1991. 5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.

Digital system Design:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Digital System Design	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123132	**SEMESTER:** Third
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan'sTheorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion. [8]

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU [8]

Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM,Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation [8]

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices. [6]

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data typesand objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits. [6]

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

Network Theory:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Network Theory	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123133	**SEMESTER:** Third
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality.Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Trigonometric and

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation. [14]

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. [10]

Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters. [12]

Text/Reference Books
1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

Signals and Systems:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Signals and Systems	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123134	**SEMESTER:** Third
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additively and homogeneity, shift-invariance, causality, stability, reliability. [6]

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output behaviour with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations. [6]

Periodic and semi-periodic inputs to an LSI system, the notion of a frequencyresponse and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.The idea of signal space and orthogonal bases, [8]

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour. [8]

The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis. [4]

State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems. [4]

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
5. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.

Data Structures & Algorithms:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Data structures and Algorithms	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Computer Science and Engg.	**CATEGORY:** ES
CODE: 1112131	**SEMESTER:** Third
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Basic Terminologies & Introduction to Algorithm and Data Organization: **[6L]**
Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction.

Linear Data Structure: [10L]
Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Non-linear Data Structure:
[10L]

Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations (search and traversal algorithms and complexity analysis) & Applications of Non-Linear Data Structures.

Searching and Sorting on Various Data Structures: **[10L]**
Sequential Search, Binary Search, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort, Introduction to Hashing

Text/Reference Books:

1. Data Structures using C and C++ by Y. Langsam, M. J. Augenstein, A.M. Tanenbaum, Prentice Hall of India
2. Classic Data Structures by D. Samanta, Prentice Hall of India
3. Data Structures by S. Lipschutz, Tata McGraw Hill
4. Introduction to Algorithms by T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Prentice Hall of India

Engineering Mathematics III:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Data structures and Algorithms	**COURSE CREDIT :** 0 [2-0-0]
DEPARTMENT: Mathematics	**CATEGORY:** BS
CODE: 1191131	**SEMESTER:** Third
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Linear Algebra: Determinant and its properties (up to third order), Minor and cofactors, Matrices, addition, multiplication and transpose of a matrix, Symmetric and skew-symmetric matrices and their properties, Adjoint, Inverse matrix, Rank of matrix, Solution of linear system by using Gaussian elimination, LU decomposition method. Vector space, Dimension, orthogonality, projections, Gram-Schmidt orthogonalization.

Eigenvalue and Eigen vectors; positive definite matrices. Linear transformations, Hermitian and unitary matrices.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Vector Calculus: Physical significances of grad, div, curl. Line integral, surface integral, volume integral- physical examples in the context of electricity and magnetism and statements of Stokes theorem and Gauss theorem [No Proof]. Expression of grad, div, curl and Laplacian in Spherical and Cylindrical co-ordinates.

Complex Analysis: Differentiation of complex functions, Cauchy Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties. Contour integrals, Cauchy Goursat theorem (without proof), Cauchy integral formula (without proof), Liouville‟s theorem and Maximum Modulus theorem (without proof); Taylor‟s series, Zeros of analytic functions, Singularities, Laurent‟s series; Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Text Books:

1. Advanced Higher Algebra, Chakravorty and Ghosh, U N Dhar Pvt. Ltd.ISBN 9789380673677
2. Higher Algebra, S. K. Mapa, Levant Books.
3. Integral Calculus including Differential Equations, Das and Mukherjee, U N Dhar Pvt. Ltd.ISBN: 978-9380673882
4. Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd. ISBN:9789380673448,
5. Advanced Engineering Mathematics, E Kreyszig, Wiley
6. S. Ponnusamy, Foundation of Complex Analysis, Narosa Publishing House, ISBN: 9788173196294

Reference Books:

7. Ghosh and Maity, An Introduction to Analysis: Differential Calculus, New Central Book Agency, 2011, ISBN: 9788173812026
8. G.F. Simmons, Differential Equations with applications and Historical Notes, CRC Press ISBN: 978-1-4987-0259-1
9. M.D. Raisinghania, Ordinary and Partial Differential Equation, S.Chand and Company, 2006 ISBN 81-219- 0892-2
10. Advanced Engineering Mathematics 8e by Erwin Kreyszig is published by Wiley India
11. D. Poole, Linear Algebra – A Modern Introduction, CENGAGE Learning, 2015 ISBN: 978-81-315-30245

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

SEMESTER: IV

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Analog Electronics	PC	1123141	3	3	0	0
2	Analog Communication	PC	1123142	3	3	0	0
3	Microprocessor and microcontrollers	PC	1123143	4	3	1	0
4	Numerical Methods	BS	1191141	3	3	0	0
5	Database Management System	ES	1112143	3	3	0	0
6	Mentored Seminar – II	PSE	1127341	1	0	0	2
7	Analog Electronics Lab	PC	1123341	1	0	0	2
8	Analog Communication Lab	PC	1123342	1	0	0	2
9	Microprocessor and microcontrollers Lab	PC	1123343	1	0	0	2
10	Database Management System Lab	ES	1112243	1	0	0	2
11	Foreign Language - IV - Spanish	MUS	1278141	2	2	0	0
	Foreign Language - IV - German	MUS	1278142				
	Foreign Language - IV - Japanese	MUS	1278143				
	Foreign Language - IV - French	MUS	1278144				
	Total Credit (PC-13, ES-4,BS-3, PSE-1, MUS-2)			23	28 Hrs./Week		

Analog Electronics:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Analog Electronics	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123141	**SEMESTER:** Forth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction to Electronic Circuits [8]
Diode & wave shaping circuits: Different rectifier circuits, ripple factor, efficiency, TUF, PIV, power supply filters, clipper and clamper circuits, peak detector, voltage multiplier. RC filter response for non sinusoidal signals

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

BJT circuits: [6]
Biasing and stability analysis: fixed bias, collector to base feedback bias, emitter bias, voltage divider bias, transistor as a switch, Hybrid Parameters, Frequency response: Low frequency and high frequency response, Miller effect,brief overview on multistage amplifier,

FET circuits: [6]
Biasing: fixed bias, self-bias, voltage divider bias, common drain, common gate configurations, AC analysis: Modeling (small signal model), expressions for input impedance, output impedance, voltage gain for different configurations like fixed bias, self-bias, voltage divider bias, common drain, common gate configurations Frequency response: low frequency and high frequency response, Miller effect .

Multistage amplifiers: Cascaded BJT and FET amplifiers, frequency response of R-C coupled multi- stage amplifier.

Feedback concepts, connection types, practical circuits, phase and frequency considerations. [4]

OPAMP circuits: Basics, differential amplifier circuit, concept of open loop and closed loop gain, DC offset and frequency parameters, slew rate, differential and common mode operation , applica- tions: inverting and non-inverting amplifier, transresistance amplifier, transconductance amplifier, log and antilog amplifier, adder, subtractor, multiplier, divider, buffer, differentiator and integrator, active filters, Equation solver, Schmitt trigger and multivibrators, rectifier clipper and clamper circuits, peak detector. [8]

Regulated Power Supply: Voltage regulation, Zener diode & IC regulator, regulation factor, filter circuit‘s discrete transistor voltage regulation (series and shunt), switching regulators, switch mode power supply. [4]

Text Books:

1. J. Millman, C. Halkias and S. Jit, ‖Electronic Devices and Circuits‖, Tata McGrawHill, 4th edition, 2015.
2. Adel S. Sedra and Kenneth C. Smith, ‖Microelectronic Circuits-Theory and applications‖, seventh Edition , 2017
3. Thomas L. Floyd, David M. Buchla, ‖Fundamentals of Analog Circuits‖, Pearson, 2nd Edn

Analog Communication:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Analog Communication	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123142	**SEMESTER:** Forth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction to basic elements of communication systems. [2]

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Signal transmission through linear systems: condition for distortion less transmission of signals through networks. Different types of distortion and their effect on the quality of output signals, transmission of transient signals, distortion analysis. [4]

Amplitude modulation: Modulation principle and definitions, sideband and carrier power, gener- ation of AM signal, demodulation of AM signal. Different type of modulator circuits, square law modulator, balanced modulator, etc.. Demodulator basic principle of coherent detections, square law detectors, average envelope and peak envelope detectors. quadrature amplitude modulation (QAM), amplitude modulation: single sideband (SSB), generation of SSB signals, selective filtering method, phase shift method, demodulation of SSB-SC signals, envelop detection of SSB signals with a car- rier (SSB+C), amplitude modulation: vestigial sideband (VSB), envelop detection of VSB+C signals, noise in AM receivers using envelope detection, concept of SNR. [12]

Frequency and phase modulation: principles and definitions, relationship between frequency and phase modulations. phase and frequency deviations, spectrum of FM signal, bandwidth considera- tions. Effect of modulation index on bandwidth, narrow band and sideband FM and PM principles, circuit for realization of FM and PM. Demodulation Principle of demodulation: different type of demodulator, discriminator, use of PLL etc. [8]

Radio transmitter: Basic block diagram of radio transmitter (AM and FM), Analysis of a practical circuit diagram used for medium power transmitter. Radio receiver Basic block diagram of TRF, superheterodyne principle, its advantages, Mixer principle and circuit, AVC, Radio receiver measure- ment. System noise calculation Signal to noise ratio of SSB, DSB, AM for coherent and envelope and square law detection, threshold effect. Signal to noise calculation for FM and threshold. [10]

Text/Reference Books:

1. Modern Digital and Analog Communication Systems - B.P Lathi, Zhi Ding
2. Communication Systems - Simon Haykin
3. Principles of Communication Systems- Taub, Schilling

Microprocessor and Microcontroller

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Microprocessor and Microcontroller	**COURSE CREDIT :** 04 [3-1-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123143	**SEMESTER:** Forth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Overview of Microcomputer systems and their building blocks – Intel 8085 Microprocessor Unit (MPU) Architecture – Interfacing with Memory and I/O Devices [5]

Introduction to 8085: Instruction Set and Assembly Language Programming (ALP), Counters and Time Delays, Stack and Subroutines [10]

Concept of Interrupts and Direct Memory Access [4]

Interfacing with Peripheral Devices – D/A and A/D Converters, Parallel I/O, Timer – Serial I/O and Data Communication [4]

Application / System Level Interfacing Design, Introduction to Single-chip Microcomputer / Intel 8051 Microcontroller Architecture and Programming [5]

Trends in Microprocessor Technology: Introduction to Intel 8086 / 8088 – Arithmetic Coprocessor , Advanced Coprocessor Architecture -286, 486, Pentium - Introduction to RISC Processors. [4]

Keyboard Interface controller-8279 [2]

DMA Controller [2]

Text/Reference Books:

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 2013/2015
2. . D A Patterson and J H Hennessy, "Computer Organization and Design: The hardware and software interface. Morgan Kaufman Publishers.
3. 3. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.
4. 4. Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing, 1996.

NUMERICAL METHODS

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Numerical Methods	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Mathematics	**CATEGORY:** BS
CODE: 1191141	**SEMESTER:** Forth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.

Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.

Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method.

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.

Text Books:
1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

References:
1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
5. Srimanta Pal: Numerical Methods, OUP.

Database Management System:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: DBMS	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Computer Science and Engg.	**CATEGORY:** ES
CODE: 1112143	**SEMESTER:** Forth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Module 1 Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Module 2: Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Module 3: Storage strategies: Indices, B-trees, hashing.

Module 4: Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Module 5: Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Module 6: Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Text books:
1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

SEMESTER: V

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Electromagnetic theory and wave propagation	PC	1123151	3	3	0	0
2	Digital communication System	PC	1123152	4	3	1	0
3	Digital Signal Processing	PC	1123153	4	3	1	0
4	Elective - I (Professional) - Power Electronics	PE	1124151A	3	3	0	0
	Elective - I (Professional) - Speech and Audio Processing	PE	1124151B				
5	Elective - I (Open) - Artificial Intelligence	OE	1115151A	3	3	0	0
	Elective - I (Open) - Computer Organization and Architecture	OE	1115151B				
6	Mentored Seminar – III	PSE	1127351	1	0	0	2
7	Electromagnetic theory and wave propagation Lab	PC	1123251	1	0	0	2
8	Digital communication Lab	PC	1123252	1	0	0	2
9	Digital signal Processing Lab	PC	1123253	1	0	0	2
	Total Credit (PC-14, PE-3,OE-3,PSE-1)			21	25 Hrs./Week		

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Electromagnetic Theory and Wave propagation:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Electromagnetic Theory and Wave Propagation	**COURSE CREDIT :** 03 [3-01-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123151	**SEMESTER:** Fifth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface. [4]

Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, S-parameters, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements. [10]

Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor [6]

Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary. [6]

Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide. [6]

Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna, [4]

Text/Reference Books:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
4. David Cheng, Electromagnetics, Prentice Hall

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Digital Communication Systems:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Digital communication systems	**COURSE CREDIT :** 04 [3-01-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123152	**SEMESTER:** Fifth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

- Formatting in base band transmission techniques: [10]

Why digital communication, Analog vs. digital communication, Model of digital communication system, Dig. Comm.. goal, Performance metrics, two basic steps of digital communication, Sampling, quantization, revisited the concept of sampling and the concept of sampling in transmitting multiple band limited signal, PAM signal, channel BW of PAM, concept of signal reconstruction, practical examples of sampling, quantization of signals, PCM system, quantization error, PCM modulator, demodulator, pros and cons, uniform and non-uniform quantization, companding, μ-law and A-law compressions, input-output characteristics, DPCM, DM, start-up, hunting, slope-overload error, ADM, algorithms for varying step size.

- Signalling formats [4]

unipolar, bipolar, NRZ, RZ, Manchester and Gray with emphasis on power spectra, ISI, eye pattern, concept of equalization, linear transversal equalizer.

- Signal detection: [10]

Geometric interpretation of signals, Schwarz‘s inequality, concepts of orthogonality and orthonormality, Gram-Schmidt orthogonalization process, roles of multipliers and correlators, bank of correlators in noisy environment, channel characterization, likelihood functions, memory less channel, signal detection in presence of noise, maximum-likelihood detector, observation space, decision regions, conditional probability of symbol error, error function, complementary error function, correlation receiver, matched filter receiver, maximization of signal to noise ratio, properties of matched filter.

- Digital modulation techniques: [8]

Digital modulation formats, coherent systems – BPSK, BFSK, QPSK& MSK: signal constellation, average probability of symbol error, Generatoins and degenerations of various modulations, non-coherent systems – BFSK & DPSK: derivation of transmitter and receiver, concept of M-ary communication, bandwidth efficiency, comparison of binary and quaternary modulation systems.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

- Information theory and coding: [8]

Concept of uncertainty, discrete messages, amount of information, probability of occurrence, concept of binit, unit of information, Entropy, properties of entropy, information rate, source coding theorem, ShanonFanoalgorithm, Shanon‘s theorem, channel capacity, Gaussian channel, bandwidth-SNR trade off, Shannon‘s limit, introductory idea of linear block code, generator and parity-check matrices, encoder, error detection and correction, syndrome decoding, decoder.

Text Books:

1. Communication Systems, Simon Haykin, 4th Edition, Wiley
2. Modern Analog and Digital Communication systems, B.P. Lathi, Oxford Publication, 4th Edition

Digital Signal Processing:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Digital Signal processing	**COURSE CREDIT :** 04 [3-01-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123153	**SEMESTER:** Fifth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT),Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems [20]

Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters. [10]

Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi rate signal processing. Application of DSP. [10]

Text/Reference Books:

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.
4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall,
5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992. 6. D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Power Electronics:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Power Electronics	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PE
CODE: 1124151A	**SEMESTER:** Fifth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBTTreatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based).Concept of fast recovery and schottky diodes as freewheeling and feedback diode. [10]

Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor. [8]

Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper [4]

Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter [6]

Switching Power Supplies: Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter - series loaded half bridge DC-DC converter. Applications: Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive. [8]

Text /Reference Books:
1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India.
2. Ned Mohan, Robbins, “Power electronics”, edition III, John Wiley and sons.
3. P.C. Sen., “Modern Power Electronics”, edition II, Chand& Co.
4. V.R.Moorthi, “Power Electronics”, Oxford University Press.
5. Cyril W., Lander,” Power Electronics”, edition III, McGraw Hill.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

6. G K Dubey, S R Doradla,: Thyristorised Power Controllers", New Age International Publishers. SCR manual from GE, USA.

Speech and Audio Processing

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Speech and Audio Processing	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PE
CODE: 1124151B	**SEMESTER:** Fifth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction- Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid ; Requirements of speech codecs –quality, coding delays, robustness. [6]

Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters,convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation. Linear Prediction of Speech- Basic concepts of linear prediction; Linear Prediction Analysis of non-stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction. [10]

Speech Quantization- Scalar quantization–uniform quantizer, optimum quantizer,logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types. [6]

Scalar Quantization of LPC- Spectral distortion measures, Quantization based onreflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, quantization based on LSF. [6]

Linear Prediction Coding- LPC model of speech production; Structures of LPC encoders and decoders; Voicing detection; Limitations of the LPC model. [4]

Code Excited Linear Prediction-CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero-input zerostate method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP. Speech Coding Standards-An overview of ITU-T G.726, G.728 and G.729standards [10]

Text/Reference Books:

1. "Digital Speech" by A.M.Kondoz, Second Edition (Wiley Students Edition), 2004.
2. "Speech Coding Algorithms: Foundation and Evolution of Standardized Coders", W.C. Chu, WileyInter science, 2003.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Computer Organization and Architecture

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Computer Organisation and Architecture	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Computer Science and Engg.	**CATEGORY:** OE
CODE: 1115151B	**SEMESTER:** Fifth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Concepts Moore‘s Law, Basic Organization of a Computer and Underlying technology

Computer Performance
CPU time, Amdahl‘s Law, CPU Performance Equation.

Computer Instructions
Operations and Operands of the hardware, example conversions from C to MIPS.

ALU Design
Realization of basic arithmetic (addition, subtraction) and logical (AND, OR, NOT) operations, Faster Addition using Carry Look ahead.

Computer Arithmetic
Representation of numbers, Addition, Subtraction, Multiplication, Division operations (flowcharts, block level hardware designs).

Processor Design
CPU Design, Datapath Building, Control Unit Design using Hardwired Control and Microprogrammed Control, Overview of Parallel Processing.

Memory Design
Memory Hierarchy, Basics of Cache, Cache Performance, Different Cache Designs - direct mapped, fully associative and set associative caches, virtual memory.

I/O Organization
Basics, Programmed I/O –memory-mapped I/O and I/O mapped I/O.

Text/Reference Books:

1. D. A. Patterson and J. H. Hennessy, "Computer Organization and Design: The Hardware/Software Interface‖, Morgan Kaufman.
2. J. P. Hayes, ―Computer Organization and Architecture‖, McGraw Hill.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Artificial Intelligence:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Artificial Intellegence	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Computer Science and Engg.	**CATEGORY:** OE
CODE: 1115151A	**SEMESTER:** Fifth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction:
Overview; Foundation; History; The State of Art.

Intelligent Agents: Agents and environment; Rationality; The nature of environment;

The structure of agents, Solving Problems by Searching: Problem-solving agents; Well defined problems & solutions; Formulating problems; Searching for solution;Uninformed search strategies: (BFS, DFS, DLS, IDDFS, Bidirectional Search)

Informed Search and Exploration: Informed search strategies; Heuristic functions; On-line search agents and unknown environment.

Constraint Satisfaction Problems:Constraint satisfaction problems; Backtracking search for CSPs; Local search for CSPs.

Adversial search:Games; Optimal decisions in games; Alpha-Beta pruning.

Logical Agents: Knowledge-based agents; The wumpus world as an example world; Logic: Propositional logic Reasoning patterns inpropositional logic.

First-order Logic: Syntax and semantics of first-order logic; Use of first-order logic.

Text Book:
1. Artificial Intelligence: A Modern Approach –Stuart Russel, Peter Norvig, 3rd Edition, Pearson Education

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

SEMESTER: VI

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Control System	PC	1123161	3	3	0	0
2	VLSI Design	PC	1123162	3	3	0	0
3	Project Management and Entrepreneurship Skill	HSM	1246161	3	3	0	0
4	Elective - II (Open) - Fuzzy Set Theory And Decision Making	OE	1125161A	3	3	0	0
	Elective - II (Open) - Machine Learning	OE	1125161B				
	Elective - II (Open) - Operating System	OE	1125161 C				
5	Elective - II (Professional) - Information Theory & Coding	PE	1124161A	3	3	0	0
	Elective - II (Professional) - Introduction to MEMS	PE	1124161B				
	Elective - II (Professional) - Bio medical Electronics	PE	1124161 C				
6	Elective - III (Professional) - Digital Image Processing	PE	1124162A	3	3	0	0
	Elective - III (Professional) - Digital Switching & Computer Networks	PE	1124162B				
7	Mentored Seminar – IV	PSE	1117361	1	0	0	2
8	VLSI Design Lab	PC	1123261	1	0	0	2
9	Elective - III (Professional) - Digital Image Processing - Lab	PE	1124262A	1	0	0	2
	Elective - III (Professional) - Digital Switching & Computer Networks - Lab	PE	1124262B				
	Total Credit (PC-07, PE-07,OE-03,PSE-1,HSM-03)			21	24 Hrs./Week		

Control System:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Control System	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123161	**SEMESTER:**Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Introduction to control problem- Industrial Control examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.

Feedback control systems- Stability, steady-state accuracy,transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feedforward and multi-loop control configurations, stability concept, relative stability, Routh stability criterion.

Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.

Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequencydomain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.

State variable Analysis- Concepts of state, state variable, state model, state modelsfor linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability & observability.

Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, treking problem. Nonlinear system – Basic concept & analysis.

Text/Reference Books:
1. Gopal. M., “Control Systems: Principles and Design”, Tata McGraw-Hill, 1997.
2. Kuo, B.C., “Automatic Control System”, Prentice Hall, sixth edition, 1993.
3. Ogata, K., “Modern Control Engineering”, Prentice Hall, second edition, 1991.

VLSI Design

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: VLSI Design	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PC
CODE: 1123162	**SEMESTER:** Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

IC DESIGN :
Introduction Discrete and Integrated Circuit: TTL, DTL, IIL, ECL, MOS and CMOS IC. [6]

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Introduction to analog design, symbols, MOSFET as switch, derivation of I/V characteristics, second order effects, MOS device layout, MOS small signal model, [6]

SPICE simulation models. Single-stage amplifiers, different common-source stages, source follower, common-gate stage, cascode stage. Differential amplifiers, active diode resistors and switched capacitor resistors; current sinks and sources, current mirrors and amplifiers, voltage and current references, cascade amplifiers; operational amplifiers; design of twostate and cascade op Amp. [8]

Analogue circuits: comparators, switched capacitor amplifiers, integrators, filters; DAC and ADC circuits. [4]

MOS inverters: definition and properties, MOS and CMOS inverter, VTC characteristics, BI CMOS circuit technique BI CMOS device and technology. [4]

VHDL and VERILOG: Basic language elements: data objects, classes and data types, operators, overloading, logical operators, VHDL representation of digital design entity, entity and architectural declarations, introduction to behavioral, dataflow and structural models. [4]

FPGA Design and Architecture: Introduction and fundamental concepts, the origin of FPGA, FPGA architecture and design Flows. [4]

Text/Reference Books:
1. S.M Kang and Y.Leblebici., CMOS Digital Integrated Circuits.
2. R.L.Geiger, VLSI Design Techniques for Analog and Digital Circuits,
3. Wayne Wolf , Modern VLSI Design systems on Silicon
4. J.M.Rebaey , Digital Integrated Circuits

Project Management and Entrepreneurship Skill

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Project Management and Entrepreneurship Skill	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Computer Sc. & Engg.	**CATEGORY:** HSM
CODE: 1246161	**SEMESTER:** Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Innovation: What and Why?
Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations. Class Discussion- Is innovation manageable or just a random gambling activity?

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Building an Innovative Organization

Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture Class Discussion- Innovation: Co-operating across networks vs. „go-it-alone" approach.

Entrepreneurship:

Opportunity recognition and entry strategies**,** Entrepreneurship as a Style of Management**,** Maintaining Competitive Advantage- Use of IPR to protect Innovation

Entrepreneurship- Financial Planning:

Financial Projections and Valuation, Stages of financing, Debt, Venture Capital and other forms of Financing

Intellectual Property Rights (IPR)

Introduction and the economics behind development of IPR: Business Perspective, IPR in India – Genesis and Development, International Context, Concept of IP Management, Use in marketing

Types of Intellectual Property

Patent- Procedure, Licensing and Assignment, Infringement and Penalty, Trademark- Use in marketing, example of trademarks- Domain name, Geographical Indications- What is GI, Why protect them? Copyright- What is copyright, Industrial Designs- What is design? How to protects, Class Discussion- Major Court battles regarding violation of patents between corporate companies

Assignment:

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

Topic 1- Is innovation manageable or just a random gambling activity?

Topic 2- Innovation: Co-operating across networks vs. „go-it-alone" approach

Topic 3- Major Court battles regarding violation of patents between corporate companies

Text Books:

1.Joe Tidd, John Bessant. Managing Innovation: Integrating Technological, Market and Organizational Change 2.Case Study Materials: To be distributed for class discussion.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Digital Switching and Computer Network:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Digital Switching and Computer Network	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PE
CODE: 1124162B	**SEMESTER:** Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Telecommunication and Traffic Engineering: Introduction to voice and data communication systems, Circuit, message and packet switching, Evolution of switching systems, Basics of EPABX, Definition of traffic load, grade of service and blocking probability, definition of Markov chain, probability distribution of arrival service and termination process, Birth-Death (B-D) process, Modeling of switching system, Basics of Queueing Theory, Erlang's formula, Data transmission in PSTNs. [8]

Basics of Data Communications:Introduction of computer networks and data communication services, Goals, applications and classification of computer networks, Network topologies, Layered network architecture, OSI reference model, and Overview of TCP/IP protocol suite, Brief review of physical layer. [6]

Data Link Layer: Framing, flow and error control, error detection, Cyclic Redundancy Codes (CRC) for error detection, Internet Checksum, Flow and error control strategies, HDLC protocol. Media Access Control (MAC): Pure and Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, polling, token ring, MAC for wired and wireless Local Area Networks, Ethernet protocol, WiFi MAC protocol. [8]

Network Layer: IPv4 and IPv6 addressing, Routing algorithms, hierarchical routing, Link State and Distance Vector routing, Internet routing, RIP, OSPF, BGP, packet format, addressing, subnetting, CIDR, ARP, RARP, fragmentation and reassembly, ICMP; DHCP, NAT, routing for mobile hosts. [6]

Transport Layer: UDP, segment structure and operation; TCP, segment structure and operation; Sockets Reliable stream transport service; congestion control algorithms and connection management. [4]

Application Layer: World Wide Web and HTTP, electronic mail (SMTP), file transfer protocol (FTP), Domain Name Service (DNS). [4]

Network security: Basics of cryptographic systems, public key and private key cryptography, digital signatures, authentication, certificates, firewalls, Security for Wi-Fi systems LAN, VLAN, VPN, WLAN [4]

Text/Reference Books:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

1.T. Viswanathanand M. Bhatnagar, Telecommunication Switching system and Networks, PHI.
2. B. A. Forouzan, Data Communications and Networking, TMH.
3. L. L. Peterson and B. S. Davie Computer Networks: A Systems Approach, Morgan Kaufmann Series.
4. A. S. Tanenbaum, Computer Networks, PHI.
5. W. Stallings, Data and Computer Communications, Pearson.
6. J. F. Kurose and K. W. Ross, Computer Networking: A Top-Down Approach, Pearson.

Information Theory and Coding:

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Information Theory and coding	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PE
CODE: 1124161A	**SEMESTER:** Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Basics of information theory, entropy for discrete ensembles; Shannon's noiseless coding theorem; Encoding of discrete sources.

Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.

Techniques of coding and decoding; Huffman codes and uniquely detectable codes;Cyclic codes, convolutional arithmetic codes.

Text/Reference Books:

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
3. R.B. Ash, Information Theory, Prentice Hall, 1970.
4. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Introduction to MEMS

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Introduction to MEMS	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PE
CODE: 1124161B	**SEMESTER:** Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Introduction and Historical Background, Scaling Effects. Micro/Nano Sensors,

Actuators and Systems overview: Case studies. Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching.

Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.

Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect, Linear Thermal Expansion, Bending; Energy methods,

Overview of Finite Element Method, Modelling of Coupled Electromechanical Systems.

Text/Reference Book:
1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre, Micro and Smart Systems, Wiley India, 2012.
2. S. E.Lyshevski, Nano-and Micro-Electromechanical systems: Fundamentals of Nano-and Microengineering (Vol. 8). CRC press, (2005).
3. S. D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001.
4. M. Madou, Fundamentals of Microfabrication, CRC Press, 1997.
5. G. Kovacs, Micromachined Transducers Sourcebook, McGraw-Hill, Boston, 1998.
6. M.H. Bao, Micromechanical Transducers: Pressure sensors, accelerometers, and Gyroscopes, Elsevier, New York, 2000.

Antenna and Wave Propagation Credit 3 (3-0-0)

Antenna Introduction to Antenna:
Brief history of antenna, sources of radiation, different types of antenna, Antenna equation, equivalent circuit.

Radiation Mechanism:
Radiation mechanism, Oscillating Dipole, Mechanism of wave particle duality, Larmore's formula. Relativistic and non relativistic domain, Newton's laws of motion for oscillating particle.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Transmission line equivalence:
Transmission line analogy, relation among E and H in free space, equi-potential surface along length of dipole.

Field computation mechanism:
Vector magnetic potential, Hertzian Dipole, different field components, E and H plane concept, Generation of magnetic scalar and vector potential, Lorentz Gauge condition

Antenna Characteristics:
Power radiation, Poynting theorem, antenna equivalent circuit, impedance and bandwidth of antenna system, concept of antenna polarization, linear, circular and elliptic polarization, antenna effective aperture, gain directivity relation.

Dipole Antenna:
Monopole and dipole antennas, radiation properties, effect of ground, effect of scalar potential, time dilation, retarded potential, effect of dipole radiation in relativistic and non relativistic domain, different zone of field measurement

Circular loop antenna:
Effect of loop antenna, radiation method from loop.

Antenna array:
Antenna array concepts, Different types of antenna array, computation of different array parameters, feeding mechanism, array factor, element factor, pattern multiplication, parasitic array Yagi-Uda array, Concept of frequency independent antenna, spiral and log periodic antenna

Synthesis of antenna array:
Antenna synthesis using binomial, Chebychev and Taylor parameter distribution. Concept of Fourier transform in array synthesis, idea of planar array, array discreatization.

Different types of antenna :
Helical antenna, Horn antenna, parabolic reflector, antennas for wireless applications, duality principle, concept of aperture antenna, antennas used for radio astronomy.

New Design techniques in antenna:
Fractal, miniaturized antenna, impedance converter.

Propagation

Introduction:
Effect of link on EM wave propagation in different frequency ranges. Reflection, refraction, LOS vs nonLOS propagation, Medium impedance, effects of dielectric medium.

Propagation communication channel:
NOLS propagation, scattering, frequency and time spreading, multipath fading, link budget, link margin, Friss equation, EIRP, link calculation, power budget calculation in propagation.
Ground wave propagation:
Ground wave propagation, free space propagation, reflection from ground, antennas located over flat & spherical earth coverage diagram,Diffraction Effect of diffraction in propagation, Raleigh scattering, Effect of knife edge, Newton's ring phenomenon.

Surface waves:

Interference effects of ground, dipole model, method of image.

Tropospheric propagation:
Tropospheric scatter, ducts & non-standard refraction. 4/3 model.

Propagation attenuation:
Effects of gaseous molecules over propagation, frequency dependency, 60GHz model, rain attenuation, effects of snow on propagation model.

Ionosphere:
Basic physics of ionosphere, ionospheric propagation, including effects of the earths' magnetic fields,zyro frequency, virtual height, MUF, oblique propagation, wireless and mobile environment, optimal effective height.

Text/Reference Books:

1. Feynman lecture series :Vol 2 Feynman
2. Antenna Theory analysis and design :Balanis 3rd Ed
3. Antenna :J.D.Kraus
4. Fields and waves in communication electronics :RamoWhinnery, 3rd ed
5. Electromagnetic waves and radiating system: Jordon Balmain , 2nd ed
6. Ionospheric radio; electromagnetic wave series 31, IET: K. Davies
7. Antenna and radio wave propagation. McGraw-Hill ed : Collin RE

Bio Medical Electronics

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Bio Medical Electronics	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PE
CODE: 1124161C	**SEMESTER:** Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Brief introduction to human physiology. Biomedical transducers: displacement,velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.

Bio-electrodes and biopotential amplifiers for ECG, EMG, EEG, etc. Measurement of blood temperature, pressure and flow. Impedance plethysmography. Ultrasonic, X-ray and nuclear imaging.

Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects.

Text/Reference Books:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

1. W.F. Ganong, Review of Medical Physiology, 8th Asian Ed, Medical Publishers, 1977.
2. J.G. Websster, ed., Medical Instrumentation, Houghton Mifflin, 1978.
3. A.M. Cook and J.G. Webster, eds., Therapeutic Medical Devices, Prentice-Hall, 1982.

Digital Image Processing

COURSE INFORMATION:

SCHOOL : Engineering & Technology	**COURSE TYPE:** L-T-P
NAME: Digital Image Processing	**COURSE CREDIT :** 03 [3-0-0]
DEPARTMENT: Electronics & Communication Engg.	**CATEGORY:** PE
CODE: 1124162A	**SEMESTER:** Sixth
PRE-REQUISITE (If Any):	

SYLLABUS OUTLINE:

Image Representation and Modeling :Monochrome and color representation, colorordinate systems Monochrome and Color vision Model, sampling and Quantization – Rectangular and Nonrectangular Grid sampling and interlacing. Optimum Lioyd-Max quantizer, Compandor design, Practical limitations.

Image Transforms : Two dimensional Orthogonal Transforms, Basic Image, Kroneeker products and Dimensionality: proportion Algorithm etc. for D F T. HadamardHaar, Slant, DCT and KL Transforms, SUD techniques Image Enhancement, Point operation, Histogram Modeling, Spatial operations, Transform cooperations, Image RestorationIncrease and Weian Filtering, Filtering using transforms, Least square and constrained least square restoration. Maximum Entropy Restoration.

Image Analysis and Vision : Spatial features extraction, Transform, Features, Edge detection, Boundary detection, region representation, Moment Refresevation, Structucturessgape, Texture, Scene Matching, Image segmentation and classification techniques.

Image Data Compression :Paxel coding: Entropy coding, Runlength coding, Bit plane coding Predioctive coding. Delta and DPCM techniques, Transform coding –zonal versus threshold coding. Adaptive transform coding. Vector quantization for compression

Text/Reference Books:
1. Rafale C.Gonzales& R. E. Woods, Digital Image Processing

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Operating System Credit 3(3-0-0)

Hierarchical and extended machine view.

Processor management: State model, job scheduling, process scheduling, multi-processor scheduling, process synchronization, deadlock problem.

Memory management: Single contiguous allocation, partitioned allocation, paging, segmentation, demand paged memory management.

Device management: Dedicated, shared and virtual devices, channels and I/O control units, device allocation, I/O traffic controller, I/O scheduler.

Information management: File systems, allocation, strategy, recovery of files.

Introduction to the distributed operating systems. Case study: DOS, UNIX, LINUX WINDOWS etc

Text/Reference Books:
1. Operating Systems by Staru E. Madnick and John J. Donovan
2. Operating Systems Concepts by Abraham Silberschatz, Peter B. Galvin and Gerg Gagne

SEMESTER: VII

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Constitution of India	MUS	1236171	2	2	0	0
2	Elective - III (Open) - Cyber Security	OE	1115171A	3	3	0	0
	Elective - III (Open) - Web Technology	OE	1115171B				
3	Elective - IV (Professional) - Microwave Theory and Techniques	PE	1124171A	3	3	1	0
	Elective - IV (Professional) - Satellite Communication	PE	1124171B				
	Elective - IV (Professional) - Internet of Things	PE	1124171C				
4	Elective - V (Professional) - Embedded System	PE	1124172A	3	3	1	0
	Elective - V (Professional) - Wireless Sensor Network	PE	1124172B				
	Elective - V (Professional) - Wavelet Transform	PE	1124172C				
5	Project – I	PSE	1127471	3	0	0	6
6	Elective - V (Professional) - Embedded System - Lab	PE	1124271A	1	0	0	2
	Elective - V (Professional) - Wireless Sensor Network - Lab	PE	1124271B				
	Elective - V (Professional) - Wavelet Transform - Lab	PE	1124271C				
7	Summer Training	PSE	1127371	2	0	0	0

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

	Total Credit (PE-07,OE-03,PSE-5, MUS 2)			17	21 Hrs./Week

Cyber Security Credit 3 (3-0-0)

Introduction: Cyber Security , Cyber Security policy, Domain of Cyber Security Policy, Laws and Regulations Enterprise Policy, Technology Operations, Technology Configuration -Strategy Versus Policy, Cyber Security Evolution, Productivity, Internet, E commerce, Counter Measures Challenges. Botnets

Cyber security objectives and guidance Cyber Security Metrics, Security Management Goals, Counting Vulnerabilities, Security Frameworks, E-Commerce Systems, Industrial Control Systems, Personal Mobile Devices, Security Policy Objectives, Guidance for Decision Makers, Tone at the Top, Policy as a Project, Cyber Security Management, Arriving at Goals, Cyber Security Documentation, The Catalog Approach, Catalog Format, Cyber Security Policy Taxonomy. Cyber governance issues

Cyber Governance Issues, Net Neutrality, Internet Names and Numbers, Copyright and Trademarks, Email and Messaging, Cyber User Issues, Malvertising, Impersonation, Appropriate Use, Cyber Crime, Geo location, Privacy, Cyber Conflict Issues, Intellectual property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare.

Cyber infrastructure issuesCyber Infrastructure Issue, economics, finance and banking, Health care, Industrial Control systems. Cyberinsurance, cyber security in international relations.

Text Book
1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss “Cyber Security PolicyGuidebook” John Wiley & Sons 2012.

Web Technology Credit 3 (3-0-0)

Introduction to Web: Web Architecture, Web Applications ,Web servers, Web Browsers, Internet standards.

Web Protocols: HTTP, DNS, SMTP etc.

HTML: Elements, Attributes, Tags, Forms, Frames, Tables.

Cascading Style Sheets: Advantages, Rules, CSS and page Layout

JavaScript and DHTML: Regular Expression, Event Handing, W3C Event Handing Model, HTML DOM, JavaScript and HTML DOM, JavaScript and HTML Forms, AJAX.

XML Technologies: XML, Namespace, DTD, W3C XML Schema, XPath, XQuery, Parsing XML, XML DOM, XSLT, XSL-FO.

Applets: Client-side Java, Life Cycle, Writing an Applet, Compiling an Applet, The Applet Tag, Security, Utility Methods, Using Status Bar, AppletContext Interface, Document Base and Code Base, Passing Parameter, Event Handling, Communication between Two Applets, Loading Web Pages.

Web Development: HTML, Structure, Tags, Lists, Table, Link and it’s types ,Images, Form, Frame, Style sheets and it’s type

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Introduction to Java:Java and Java applications, Java Virtual Machine(JVM), Java Runtime Environment(JRE)Java DevelopmentKit(JDK,) Byte code, Java characteristics, Object oriented Programming, Simple java programs, Data types,Operators, Expressions, control statements, Selection statements, Iteration statements, Jump statements

Classes, Inheritance :Classes in java, Declaring a class, Creating instances of class, Constructors, Argument Passing, use of statickeyword, Innnerclass. Method overloading, Inheritance, use of super keyword ,Method overriding, Abstract class,Dynamic method dispatch, use of final keyword

Interface, Package: Package, Acesss control mechanism, Interface, Dynamic Method look up

Exception Handling: Java Exception Handling Mechanism, try, catch, throw, throws and finally, Exception types, Built in Exceptions: checked and unchecked exceptions, User defined Exceptions

String Handling: String and String Buffer, Constructors, String operations: character extractions, String comparisons, searching, strings, modifying a string. To String() and valueOf() methods, String Buffer operations

Java I/O Stream:I/O basics, Byte stream, Character stream, Reading console input, Writing console output, Reading and writing files

Java Utility package: Collection overview, Collection interfaces, Collection classes: Array List, Linked List, Accessing a collection using, iterator and for-Each statement

Applet: Applet class, Applet architecture, Applet Skeleton, Life cycle methods, set Foreground() and setBachground()methods,Using the status window,HTML Applet tag, Passing parameters to an applet, GetCodebase() andGetDocumentbase() methods.

Event Handling and AWT: Delegation Event Model, Event classes, Sources of Events, Event Listener interfaces,Event handling using adapter class, Inner and anonymous class, AWT classes: Label,Button,TextField etc

Text Book
1. Java-The Complete Reference,Herbert Schildt, 9th Edition, McGraw Hill Education 2014

Microwave Engineering Credit 3 (3-0-0)

Introduction to Microwaves- History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC.

Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission. Analysis of RF and Microwave

Transmission Lines-Coaxial line, Rectangular waveguide, Circular waveguide, Strip line, Micro strip line.

Microwave Network Analysis-Equivalent voltages and currents for non-TEM lines, Network parameters for microwave circuits, Scattering Parameters.

Passive and Active Microwave Devices-Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Microwave active components: Diodes, Transistors, Oscillators, Mixers. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes.

Microwave Tubes: Klystron, TWT, Magnetron. Microwave Design Principles-Impedance transformation, Impedance Matching,

Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design.

Microwave Antennas-Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.

Microwave Measurements-Power, Frequency and impedance measurement atmicrowave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.

Microwave Systems-Radar, Terrestrial and Satellite Communication, Radio Aidsto Navigation, RFID, GPS. Modern Trends in Microwaves Engineering-Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.

Text/Reference Books:
1.R.E. Collins, Microwave Circuits, McGraw Hill
2.K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house

Satellite Communication Credit 3 (3-0-0)

Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication.

Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.

Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.

Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift. Satellite link budget Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.

Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.

Text /Reference Books:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

1.Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002
2.Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009 3.Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill,2009

Internet of Things Credit 3 (3-0-0)

The Internet of Things: an Overview: The flavour of the Internet of Things, The "Internet" of "Things", The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?

Design Principles for Connected Devices:Calm and Ambient Technology, Magic as Metaphor, Privacy, Web Thinking for Connected Devices, Affordances. Internet Principles:

Internet Communications: An Overview (IP, TCP, The IP Protocol Suite (TCP/IP), UDP), IP Addresses (DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6), MAC Addresses, TCP and UDP Ports, Application Layer Protocols

.Prototyping: Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Open Source versus Closed Source, Tapping into the Community.Prototyping

Embedded Devices: Electronics, Embedded Computing Basics, Developing on the Arduino, Raspberry Pi, Beaglebone Black, ElectricImp, Mobile Phone and Tablets,

Plug Computing: Always-on Internet of Things.

Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Non-digital Methods, Laser Cutting, 3D Printing, CNC Milling, Repurposing/Recycling. Prototyping Online Components:Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols.

Techniques for Writing Embedded Code: Memory Management, Performance and Battery Life, Libraries, Debugging.

Prototype to Reality: Business Models: A Short History of Business Models, The Business Model Canvas, Who Is The Business ModelFor Models, Funding an Internet of Things Startup, Lean Startups.

Moving to Manufacture: What Are You Producing?, Designing Kits, Designing Printed Circuit Boards, Manufacturing Printed CircuitBoards, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software

Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions

Text Book
1.Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley publication, 1st Edition,November 2013.

Embedded System Credit 3 (3-0-0)

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Introduction to Embedded Systems (ES), Definition, Difference between general purpose computing system and embedded system; classification of embedded systems - RISC and CISC Processors, Characteristics and Quality Attributes of Embedded Systems, Concepts of Embedded System Design, Examples of Embedded Systems Embedded Microcontroller Cores /

Designing with 8-bit Microcontroller: Architecture, Addressing modes and Instruction Set of Intel 8051 Microcontroller

Introduction to other Embedded Processors: ASIC, Digital Signal Processors, Field Programmable Gate Array, ARM - Choice of Embedded Hardware Platform Interfacing Standards – Real Time System Design Example RTOS - Hardware Software co-design, ASIC Design, Semicustomed ICs including FPGA,

Microcontroller Design

Cloud and IOT

Text / Reference Books:
1. Introduction to Embedded Systems, Shibu K V, McGraw Hill, New Delhi (2/e)
2. Embedded System Design, SantanuChattopadhyay, PHI Learning (2/e)
3. K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996.
4. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.
5. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999

Wireless Sensor Network Credit 3 (3-0-0)

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks,

Applications of Sensor Networks,

Types of wireless sensor networks Mobile Ad-hocNetworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee, Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion;

Quality of a sensor network; Real-time traffic support and security protocols.

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

Text/Reference Books:
1.Waltenegus Dargie ,Christian Poellabauer, “Fundamentals Of Wireless Sensor Networks Theory And Practice”, By John Wiley & Sons Publications ,2011
2.Sabrie Soloman, “Sensors Handbook" by McGraw Hill publication. 2009
3.Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks”, Elsevier Publications,2004
4.Kazem Sohrby, Daniel Minoli, “Wireless Sensor Networks”: Technology, Protocols and Applications, Wiley-Inter science
5.Philip Levis, And David Gay "TinyOS Programming” by Cambridge University Press 2009

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Wavelet Transform Credit 3 (3-0-0)

Introduction:
Origin of wavelets and its history, Different communities of wavelet, Classification: continuous and discrete wavelet transforms, Developments in wavelet theory applications

Continuous Wavelet Transform: Introduction Continuous time wavelets, Definition of CWT, Constant Q factor filtering interpretation and Time Frequency Resolution, CWT as an operator, Inverse CWT

Introduction to the Discrete Wavelet Transform and orthogonal Wavelet decomposition: Approximations of vectors in nested linear vector subspaces, Multi-resolution Analysis of L2(R), Haar Scaling function, Haar wavelet, Haar wavelet decomposition. Haar wavelet packets and application.

MRA Ortho -normal wavelets and their relationships to filter banks:,Construction of an ortho-normal MRA, Wavelet basis for the MRA, Digital filtering interpretation, Examples of orthogonal basis generating wavelets, Interpreting ortho-normal MRA for discrete time signals, Generating scaling functions and wavelets from filter coefficients

Bi-orthogonal Wavelets: Bi-orthogonal Wavelet bases, Filtering relationship for Bi-orthogonal filters, Bi-orthogonal scaling functions and wavelets, Two dimensional wavelet, Non separable Multi-dimensional wavelet, Wavelet Packets.

Wavelength Transform and applications: Transform coding, DTWT for image compression, audio compression, Wavelet based audio coding, video coding and multi resolution Techniques, Wavelet de-noising, Speckle removal, Edge detection and object isolation, Image fusion, Object detection, discrete wavelet multi-tone modulation.

Beyond Wavelet: Ridge lets and curve lets:Ridge let transform and Digital Curve let transform, Curve let construction, Properties and applications.

Reference Books:
1.RaguveerM.Rao and AjitS.Bopardikar-Wavelet Transforms –Introduction andapplications-Pearson Education, 2008
2.K.P Soman, K.I.Ramachandran –Insight into Wavelets from Theory to practice, PHI2006

CONSTITUTION OF INDIA, LAW AND ENGINEERING Credit 2 (2-0-0)

Module1
Introduction and Basic Information about Indian Constitution: Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947,Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.

Module 2

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Union Executive and State Executive: Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, Lok Ayukta, The Lokpal and Lok ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.

Module 3
Introduction and Basic Information about Legal System: The Legal System: Sources of Law and the Court Structure: Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme ourt). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at workplace.

Module 4
Intellectual Property Laws and Regulation to Information: Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information-Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.

Module 5
Business Organizations and E-Governance: Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.

Reference Books:

- Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition.
- Granville Austin: The Indian Constitution: Cornerstone of a Nation. 1966, Oxford Clarendon Press.
- Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.
- PM Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
- V.K. Ahuja: Law Relating to Intellectual Property Rights (2007)
- Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88
- P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi
- Prabudh Ganguli: Gearing up for Patents: The Indian Scenario, Orient Longman.
- BL Wadehra: Patents, Trademarks, Designs and Geological Indications.Universal Law Publishing - LexisNexis.
- Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections)

SEMESTER: VIII

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Sl No.	Course Name	Course Type	Course Code	Credit	Type		
					L	T	P
1	Elective - IV (Open) - Predictive analytics	OE	1125181A	3	3	0	0
	Elective - IV (Open) - Introduction to Big Data Analysis and Hadoop	OE	1125181B				
2	Elective - VI (Professional) - Wireless Communication	PE	1124182A	4	3	1	0
	Elective - VI (Professional) - Fibre Optic communication	PE	1124182B				
	Elective - VI (Professional) - Industrial Automation and Control	PE	1124182C				
	Elective - VI (Professional) - VLSI Design Automation	PE	1124182D				
3	Project-II	PSE	1127381	6	0	0	12
4	Comprehensive Viva	PSE	1127382	4	0	0	0
	Total Credit (PE-04,OE-03,PSE-10)			17	19 Hrs./Week		

Introduction to Big Data Analysis and Hadoop Credit 3 (3-0-0)

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures. UNIT III: Map Reduce Anatomy of a Map ReduceJob Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.Big SQL : Introduction
Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Text Books

1.Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015

Wireless Communication Credit 3 (3-0-0)

Fundamentals of Wireless Cellular Communication and Design Principle:

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

History of wireless communication, concept of mobile and personal communication, wireless cellular platform, the design fundamentals of cellular networks, frequency reuse, spectrum capacity enhancement techniques, cochannel and adjacent channel interference, location management, handoff management. Concept of mobile IP for mobility management issues

Propagation effects and path-loss models in wireless communication: Propagation models for wireless networks, two-ray ground reflection model, a micro-cell propagation model, a macro-cell propagation model, shadowing model, large scale path loss and shadowing, multi path effects in mobile communication, linear time variant channel model, concept of coherent bandwidth, coherent time, Doppler Shift - Effect of velocity of the mobile, models for multi path reception, mobile communication antennas.

Evolution of modern mobile wireless communication systems: personal area networks: PAN, Public wide-area wireless networks, wireless Local Area Networks.

Multiple access Techniques in wireless cellular communication: Why and what multiple access, Frequency division multiple access technology (FDMA), time division multiple access (TDMA), space division multiple access (SDMA), code division multiple access (CDMA), spectral efficiency of different wireless access technologies: spectral efficiency in FDMA system, spectral efficiency in TDMA system, spectral efficiency for DS-CDMA system.

Evolution of Mobile communication Networks: First generation Analog circuit based network, AMPS, Second Generation Mobile NetworksGSM: architecture and protocols, access technology, call set up procedure, 2.5 G networks: evolution to GPRS, concept of data communication on GPRS, session management and PDP Context, data transfer through GPRS network and routing. Introduction to 3G – 3GPP and 3GPP2 , The WCDMA based universal mobile telecommunication system (UMTS), concept of long term evolution 4G and 5G.

Text Books:
1. Wireless Communication : Principle and Practice, T.S. Rappaport, Pearson Publication
2. Wireless Communication Networks, 3G and Beyond, ItiSahaMisra, 2nd edition, Mc. GrawHill India

Fibre Optic Communication Credit 3 (3-0-0)

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.

Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation.

Fabrication of fibers and measurement techniques like OTDR.

Optical sources -LEDs and Lasers, Photo-detectors-pin-diodes, APDs, detector responsivity, noise, optical receivers.

Optical link design -BER calculation, quantum limit, power penalties.

Optical switches -coupled mode analysis of directional couplers, electro-opticswitches.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Optical amplifiers -EDFA,Raman amplifier.

WDM and DWDM systems. Principles of WDM networks. Nonlinear effects in fiber optic links. Concept of self-phase modulation, groupvelocity dispersion and solition based communication.

Text/Reference Books

1.J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
2.T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
3.J. Gowar, Optical communication systems, Prentice Hall India, 1987.
4.S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
5.G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.
6.G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997
7.F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York (1990).

Industrial Automation and Control Credit 3 (3-0-0)

Sensors: Displacement sensors, Force sensors, Ultrasonic sensors, Temperature sensors, Pressure sensors etc

Actuators: Dc motors, Servo motors, Stepper motors, Piezo electric actuators, Pneumatic actuators etc.

Signal Conditioning: Filtering, Amplifying, Isolation, ADC, DAC, Sensor protection circuits, Signal transmission and noise suppression, Estimation of errors and calibration.

Controller tuning: PI controller, PD controller, PID controller and tuning methods: Ziegler-Nichols tuning method, Cohen coon tuning method, Implementation of PID controllers (digital and analog).

Automation: PLC (Programmable logic controllers): Overview, operation and architecture, PLC programming, Applicationexamples.DCS (Distributed control systems): Overview, Advantages, Functional requirements of Distributed control systems, Communication for distributed control, Application examples. SCADA (supervisory control and data acquisition): Introduction to SCADA, SCADA system components, architecture and communication, SCADA applications

Advanced control technique :Feed forward control, Ratio control, Cascade control, Adaptive control, Duplex or split range control, Overridecontrol, internal mode control.

Text book

1. Computer-Based Industrial Control, Krishna Kant,2ndedition Prentice Hall of India Ltd.
2. Chemical Process Control –Theory and Practice, Stephanopoulous, Prentice Hall of India Ltd, 1984.
3. Fundamentals of Industrial Instrumentation and Process Control, William C. Dunn, TataMcGrawHill, 2009

VLSI Design and Automation Credit 3 (3-0-0)

Introduction to VLSI Design methodologies Review of Data structures and algorithms -Review of VLSI Design automation tools -Algorithmic GraphTheory and Computational Complexity -Tractable and Intractable problems -general purpose methodsfor combinatorial optimization.

School of Engineering & Technology
B. Tech Electronics and Communication Engineering

Layout Compaction, Placement & PartitioningLayout Compaction: Design rules -problem formulation -algorithms for constraint graph compaction –Placement & Partitioning: Circuit representation -Placement algorithms –partitioning

Floorplanning & RoutingFloor planning concepts: Terminologies, floorplan representation, shape functions and floorplan sizingRouting: Types of local routing problems -Area routing -channel routing -global routing -algorithms forglobal routing.

VLSI SimulationGate-level modeling and simulation -Switch-level modeling and simulation -Combinational LogicSynthesis -Binary Decision Diagrams -Two Level Logic Synthesis-High level Synthesis.

High Level SynthesisHardware models -Internal representation -Allocation assignment and scheduling -Simple scheduling algorithm -Assignment problem –High level transformations.

Text book

1. S.H. Gerez, "Algorithms for VLSI Design Automation", John Wiley & Sons, 2002.
2. N.A. Sherwani, "Algorithms for VLSI Physical Design Automation", Kluwar AcademicPublishers, 2002.