SIR PADAMPAT SINGHANIA UNIVERSITY
Udaipur
SCHOOL OF ENGINEERING
Course Curriculum of 4-Year B.Tech. Degree Programme in
Electronics & Communication Engineering
(Batch- 2017-21)

Credit Structure

<table>
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# Distribution of Total Credits & Contact Hours in All Semesters

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<th>Sr. No.</th>
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<th>Contact hours/week</th>
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# Course Structure: B.Tech. 2017-21

## Semester - I

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Total Credits: 21

| Total Contact Hours/week | 25 |

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Total Credit: 22

| EP-199  | Endeavour Project (Beyond the Syllabus) | |

| Total Contact Hours/week | 27 |

SPSU/SOE/ECE/B.Tech./2017 Ver. 1.1
## Semester - III

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<td>Electronic Measurement &amp; Instrumentation</td>
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Total Credits 27

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Total Contact Hours/week 32

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Total Credits 23

| 7      | EP-299      | Endeavour Project (Beyond the Syllabus)     |    |   |   |           |

Total Contact Hours/week 26
### Semester - V

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Total Credits | 23

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Total Contact Hours/week | 27

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**Total Credits** 13

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**Total Contact Hours/week**: 17
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<td>Telecommunication System Modelling &amp; Simulation</td>
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### List of Departmental Elective(s) - III

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<th>S. No</th>
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<td>Digital Image Processing</td>
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<td>EC-468</td>
<td>Digital Voice &amp; Picture Communication</td>
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<td>Fibre Optic Technology</td>
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### List of Open Elective(s) - I

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<td>Fun with Drama</td>
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### List of Open Elective(s) - III

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<td>Bioprocess Technology</td>
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<td>CS-462</td>
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<td>Solar Energy &amp; Applications</td>
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<td>PH-453</td>
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### List of Open Elective(s) - IV

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<td>CS-459</td>
<td>Statistical Simulation &amp; Data Analysis</td>
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<td>Power Generation &amp; Economics</td>
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### List of Open Elective(s) - V

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Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - I

(Departmental Core Subject)

CE-151 Engineering Mechanics 3-1-0-4

Objective: The subject deals with the concepts of static & dynamic systems involving kinematic & dynamic analysis.

Course Content

Basic principles: Equivalent force system; Equations of equilibrium; Free body diagram; Reaction; Static indeterminacy. Structures: Difference between trusses, frames & beams, Assumptions followed in the analysis of structures; 2D truss; Method of joints; Method of section; Frame; Simple beam; types of loading & supports; Shear Force & bending Moment diagram in beams; Relation among load, shear force & bending moment. Friction: Dry friction; Description & applications of friction in wedges, thrust bearing (disk friction), belt, screw, journal bearing (Axle friction); Rolling resistance. Virtual work & Energy method: Virtual Displacement; Principle of virtual work; Applications of virtual work principle to machines; Mechanical efficiency; Work of a force/couple (springs etc.); Potential energy & equilibrium; stability. Center of Gravity & Moment of Inertia: First & second moment of area; Radius of gyration; Parallel axis theorem; Product of inertia, Rotation of axes & principal moment of inertia; Moment of inertia of simple & composite bodies. Mass moment of inertia. Kinematics of Particles: Rectilinear motion; Curvilinear motion; Use of Cartesian, polar & spherical coordinate system; Relative & constrained motion; Space curvilinear motion. Kinetics of Particles: Force, mass & acceleration; Work & energy; Impulse & momentum; Impact problems; System of particles. Kinematics & Kinetics of Rigid Bodies: Translation; Fixed axis rotational; General plane motion; Coriolis
acceleration; Work-energy; Power; Potential energy; Impulse-momentum & associated conservation principles; Euler equations of motion & its application.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester – I

(Departmental Core Subject)

ME-151 Engineering Drawing & Computer Aided Drafting

Objective: Engineering drawing is a visual language of an engineer. It permits students to convert an object into its visual representation.

Course Content

Importance of engineering drawing; Conventions & standards: ISO; Scales; Curves; Orthographic projections: points, lines, planes & solids; Sections of solids; Isometric projections; Development of surfaces; Intersection of solids.

List of Experiments

1. Introduction to Engineering Graphics, Sheet Layout, instruments, BIS standards, Lines, Lettering & Dimensioning
2. Scales -Types of Scales-Plain Scale, Diagonal scale, vernier scale
3. Curves- conic sections, ellipse, parabola, hyperbola, cycloid, epicycloid, hypocycloid
4. Orthographic Projections-Introduction, multi-view projection system, orthographic views, Methods of multi-view projections, projecting side views, Sectional Views
5. Projection of Points -Introduction, position of points in I, II, III & IV quadrant
6. Projection of Lines & Auxiliary projections-, Line inclined to one plane & parallel to the other-Line inclined to both the planes. Projection on auxiliary planes
7. Projection of Planes- Introduction, Perpendicular & parallel to the reference planes
   Projections of planes inclined to one reference plane & perpendicular to the other, plane inclined to both ref. planes
8. Projection of solids with axes inclined to one of the reference plane & parallel to the other
10. Section of Solids- Sections of prisms, pyramids, cone cylinder
11. Development of Surfaces- Methods of development-Cube, prisms, pyramids, cone cylinder
12. Intersection of Surfaces- Line method-cutting plane method, Intersection of two prisms- Intersection of cylinder & cylinder
13. Isometric Projection- Isometric axes lines & planes, Isometric Scale, Isometric views of standard shapes, solids

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - I

(Departmental Core Subject)

ME-152 Manufacturing Practice

L-T-P-C 0-0-1-1

Objective: This course is intended to impart basic knowledge of various hand tools & their usage in different sections of manufacturing; including Carpentry, Fitting, House wiring, Black smithy, Tin smithy.

Course Content
Introduction to wood working, hand tools & machines; Introduction to fitting shop tools, equipment & operations; Introduction to sheet metal work; Introduction to pattern making; Introduction to moulding & foundry practice; Simple exercises in wood working, pattern making, fitting, sheet metal work & moulding.

List of Experiments
1. Demonstration of the manufacturing practices, workshop safety, trades, tools, experiments
2. Measurement of the dimensions of a given job using precision instruments
3. Fabrication of a fitting job with drilling & tapping of a hole
4. Preparation of a funnel with spout as per drawing from 30 SWG. G. I. sheet. Joints to be soldered with the soldering iron
5. Fabrication of a T-half lap joint & T-bridle joint
6. Preparation of a wooden patterns as per given drawings
7. Preparation of a mould for a given wooden pattern
8. Preparation of an aluminum casting with the help of a given wooden pattern

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronic & Communication Engineering

Semester - I

(Humanities & Basic Sciences Subject)

HU-153 Professional Communication - I

Objective: *To develop communicative competence.*

Course Content
Communication: Importance of effective communication skills, Objectives & Process of communication; Types of communication: Verbal & non-verbal; Channels of communication, Media of communication; Barriers to communication: Physical, Psychological, Mechanical, Linguistic & Cultural; Types of listening, Principles of effective listening

Word Power: Words often misspelt, One word substitute, Use of idiomatic expressions & phrases

Time & Stress Management: Planning, Scheduling & Prioritizing, Multitasking, Delegating; Saying no assertively; Stress & its causes, Barriers to stress management & Handling stress

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme

in
Electronic & Communication Engineering

Semester - I

(Humanities & Basic Sciences Subject)

CH-154 Chemistry- I

L-T-P-C 3-0-1-4

Objective: The subject deal with the concepts related to Physical chemistry & develops a scientific attitude by means of distinguishing, analyzing & solving various engineering problems. It also provides in-depth knowledge of thermodynamics, quantum chemistry, chemical kinetic, corrosion & colloids.

Course Content

Concept of Thermodynamic system: Definition with example of di thermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: different statements, mathematical form.

Internal energy: Definition, Example, Characteristics, Physical significance, Mathematical expression for change in internal Energy, Expression for change in internal energy for ideal gas. Enthalpy: Definition, Characteristics, Physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas.

heat summation, Kirchhoff’s law. 2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson & throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature. Evaluation of entropy: characteristics & expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. Work function & free energy: Definition, characteristics, physical significance, mathematical expression of ΔA & ΔG for ideal gas, Maxwell’s Expression (only the derivation of 4 different forms), Gibbs Helmholtz equation. Conditions of spontaneity & equilibrium reaction. Chemical potential, Real gas, Real Solution, Cell EMF & its Thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half-cell, quinhydrone half-cell & calomel half-cell (construction, representation, cell reaction, expression of potential, Discussion, Application). Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application). Application of EMF measurement on a) Ascertain the change in thermodynamic function (ΔG, ΔH, ΔS) b) ascertain the equilibrium constant of a reversible chemical reaction c) ascertain the valency of an ion. Corrosion - basics & impacts, Reaction laws: rate & order; molecularity; zero, first & second order kinetics. Pseudo unimolecular reaction, Arrhenius equation. Mechanism & theories of reaction rates (Transition state theory, Collision theory: Steady state approximation, Rate determining state approximations, Bohr’s theory & its limitations, de-Broglie relation, Heisenberg Uncertainty principle, Schrödinger equation, Schrödinger equation for hydrogen atom in Cartesian coordinate & polar coordinates, Significance of four quantum numbers, shape of s, p & d atomic orbitals, discovery of spin, spin quantum number & magnetic quantum number. Rules for filling electrons in orbitals, stability of half & completely filled orbitals, relative energies of atomic orbitals, anomalous electronic configurations, The properties of liquid surface, surfactants, colloidal systems, solid surfaces, physio sorption, & chemisorption.

List of Experiments

1. Determination of water hardness by complexometric titration.
2. Determination of total alkalinity of water sample.
3. Determination of chloride ion in water sample by Argentometric method.
4. Determination of total dissolved oxygen content in water sample by Wrinkler's method.
5. Copper sulfate estimation by iodometric titration.
6. Potassium dichromate estimation by iodometric titration.
7. Redox titration: Estimation of FAS by internal & external indicators.
8. Gravimetric analysis: Estimation of Ba as BaSO$_4$
9. Gravimetric analysis: Estimation of Ag as AgCl
10. pH metric measurements: Determination of strength of unknown HCl solution by pH metric titration

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - I

(Humanities & Basic Sciences Subject)

MA-151  
Mathematics - I  
L-T-P-C  
3-1-0-4

Objective: To develop an understanding of the fundamental concepts of the calculus, differential equations & linear algebra to connect them with real world problems from other disciplines along with the development of mathematical reasoning & problem solving abilities.

Course Content

Differential Calculus (Functions of one variable): Taylor’s & Maclaurin’s theorems with remainders, concavity & convexity of a curve, points of inflexion, asymptotes & curvature.

Differential Calculus (Functions of several variables): Partial derivatives & their geometrical interpretation, derivatives of composite & implicit functions, Euler’s theorem on homogeneous functions, harmonic functions, Taylor's expansion of functions of several variables, maxima & minima - Lagrange's method of multipliers.

Integral Calculus: application to length, area, volume & surface area of revolution. Multiple integrals with applications to: volume, surface area & moments of inertia.

Ordinary Differential Equations: Solution of dy/dx = f(x, y); linear differential operator L, higher order ordinary differential equations with constant coefficients.

Matrix Algebra: Rank & inverse of a matrix, consistency of linear system of equations; Eigen values, Eigen vectors & their applications to system of ordinary differential equations; Cayley-Hamilton theorem; Diagonalization of matrices.
Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester – I

(Humanities & Basic Sciences Subject)

PH-151  L-T-P-C
Physics - I  3-0-1-4

Objective: Objective of this course is to introduce concepts of electrostatics & magnetostatics leading to the Maxwell’s electromagnetic waves & understanding the wave nature of light using various optical phenomena like interference, diffraction & polarization. The particle nature of electromagnetic wave will also be introduced.

Course Content
Gauss law & its applications in electrostatics in vector form, electric polarization, permittivity, energy density in an electric field, Ampere’s law, charged particle motion in E & B fields, magnetization, Faraday’s law of electromagnetic induction; Equation of continuity, generalized Ampere’s law, Maxwell’s equations, wave equation, plane wave solutions, electromagnetic wave propagation in dielectrics & conductors, reflection/refraction, polarization, interference, diffraction of EM waves Origin of quantum hypothesis, de Broglie’s hypothesis of matter waves, Uncertainty principle, Wave function & wave mechanics, Schrodinger equation, QM operators, Expectation value, one-dimensional solutions: zero potential, step potential, potential barrier & potential well.

List of Experiments
1. Determination of wavelength of sodium light source using Newton’s Ring Method
2. Determination of wavelength of monochromatic light source using Fresnel’s Biprism
3. Determination of the wavelength of monochromatic light using Michelson Interferometer
4. Determination of wavelength of laser using single slit diffraction
5. Determination of the wavelength of prominent lines of mercury using plane transmission grating
6. Determination of specific rotation of sugar solution using Polarimeter
7. Determination of Refractive index & dispersive power of prism material using spectrometer
8. Verification of the Biot Savart’s law
9. Study of variation of magnetic field along the axis of a circular coil & determination of the radius of the coil
10. Determination of frequency of AC mains using Sonometer
11. Determination of the characteristic constant or ballistic constant of a ballistic galvanometer

Text/Reference Books
Objective: This course is an introductory course of computer science. It provides basic insight into the building blocks of a modern day computer & the newest peripherals attached with it. In addition to this, the learner is delved into the basic programming concepts of a high level language.

Course Content
Introduction to computer architecture; memory, ALU, CPU, I/O devices. Introduction to system software; operating systems, compilers & multi-user environments. Concept of an algorithm. Introduction to the design & implementation of correct, efficient & maintainable programs. Use of high level programming language for the systematic development of programs.

List of Experiments
1. Basic & calculation based programs
2. Conversion based programs
3. Decision making statement & operator based programs
4. Loop based programs
5. Multi way decision making statement based programs
6. Array based programs
7. Strings based programs
8. Function based programs
9. Structure based programs
10. Pointers based programs
11. File handling based programs

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
in
Electronics & Communication Engineering

Semester - II

(Departmental Core Subject)

EC-152
Basics of Electrical & Electronics Engineering
3-0-1-4

Objective: The aim of this course is to develop an understanding of the basics of electrical & electronics components, circuits & systems, operation of transformers & other electrical machines.

Course Content
Introduction to Transformers & AC Machines: Ideal Transformer, Circuit Model of Transformer, Efficiency, Three Phase Induction Motor.
Introduction to Fractional-kW Motors & DC Machines: Single Phase Induction Motors, DC Generator & DC Motor.
List of Experiments

1. Study & Verification of Kirchoff’s Current Law
2. Study & Verification of Kirchoff’s Voltage Law
3. Study & Verification of Thevenin’s Theorem for dc network
4. Study & Verification of Norton’s Theorem for dc network
5. Study & Verification of R-C series circuit & determination of phase angle
6. Study of the volt-ampere (V-I) characteristics for Silicon P-N Junction diode
7. Study of the volt-ampere (V-I) characteristics for a Zener diode
8. Study of the input & output characteristics for a transistor in common base configuration
9. Verification of Truth Table for basic & universal logic gates
10. Determination of copper loss & core loss for a single phase transformer through O/C-S/C Test

Text/Reference Books

Objective: To build interpersonal skills & communicate effectively.

Course Content
Business Meetings: Notice, Agenda, Minutes of Meeting
Group Discussions: Classification of GD topics; GD as a part of the selection process; GD phases; Non-verbal communication in GD, Do's & don'ts of GD.
Professional Mannnerisms & Grooming: Kinesics, Office etiquette; Telephone skills, Netiquette
SWOT, Résumé, Cover letter writing, Job Acceptance Letter.
Goal setting: Significance, Progressive steps to achieve goals; Anticipating career challenges & utilizing opportunities.

Text/Reference Books
Objective: This course aims at understanding various concepts of inorganic & organic chemistry, broad spectrum knowledge of chemical bonding, organic reaction mechanism, stereochemistry, spectroscopy, polymer science, green chemistry & environmental pollution studies.

Course Content
weapons, disarmament & peaceful uses of chemistry in day to day life. Green Chemistry, 12 principles of green chemistry, application of green chemistry in industrial processes, Renewable & Non-renewable energy resources & Primary & Secondary energy resources, Polymers, Organic Reaction Mechanism, Stereochemistry of Carbon Compounds, Basic concepts of spectroscopy, UV-VIS spectroscopy, applications, Fundamentals of Microwave & IR spectroscopy & its applications, determination of molecular structure.

List of Experiments

1. Inorganic qualitative analysis: Detection of acid radicals.
2. Inorganic qualitative analysis: Detection of basic radicals.
3. Estimation of available chlorine in bleaching powder sample.
4. Thin layer chromatography: Separation of given amino acids by TLC method.
5. Determination of rate constant of a first order reaction by titrimetric method.
7. Conductometric measurements: Determination of strength of unknown HCl solution by conductometric titration.
8. Qualitative analysis of single solid organic compounds: Detection of characteristic elements (N, Cl, Br & I) by chemical tests.
9. Qualitative analysis of single solid organic compounds: Detection of functional groups by systematic chemical tests.
10. Flame photometry: Determination of Na & K in water sample.

Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme
in
Electronics & Communication Engineering

Semester - II

(Humanities & Basic Sciences Subject)

MA-152 Mathematics - II

Objective: The objective of the course is to make the students familiar with certain important mathematical techniques involving complex analysis & transforms which have applications in various disciplines of Engineering & Technology.

Course Content


Fourier Series: Periodic functions, Fourier series representation of a function, half range series, sine & cosine series, Fourier integral formula, Parseval's identity.

Text/Reference Books
Objective: The objective of this course to introduce the notion of quantum physics & its applications in understanding the electrical, thermal & magnetic properties of various materials, band theory of solids, nanostructures, lasers, superconductivity & its applications.

Course Content
List of Experiments

1. Determination of Planck’s constant using Light Emitting Diode
2. Determination of temperature coefficient, reverse saturation current & energy band gap of a P-N junction
3. Determination of the energy band gap of semiconductor using four-probe method
4. Determination of the charge carrier concentration & Hall coefficient of a given semiconductor using Hall experiment setup
5. Determination of the ratio of $e/m$ for the electron using the helical method
6. Determination of electronic charge by Millikan’s oil drop method
7. Determination of velocity of ultrasonic waves using quartz crystal
8. Determination of wavelength of He-Ne laser using millimeter scale as a grating
9. Determination of wavelength of Diode laser using single slit / double slit & obtain diffraction patterns of different apertures
10. Determination of numerical aperture of an optical fibre cable
11. Determination of capacitance of a parallel plate capacitor with & without dielectric material
12. Determination of the height of a distant object/building with the help of sextant

Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme

Endeavour Project (Beyond the Syllabus) 0-0-0-3

Our University is continuously looking at innovative ways to deliver knowledge to our students, making learning & delivery mechanism innovative, interesting & easy with truly ‘out of the box’ teaching-learning process. This beyond the syllabus initiative uses all working second Saturdays as class days.

Endeavour is a compulsory interdisciplinary project for all students of the University. Respective Heads of the Department shall select students & form groups. Each project shall be supervised by a faculty member.

The faculty of SPSU will select a contemporary topic, which is preferably industry relevant & associate a company or professional who can provide application-oriented perspective. The topic chosen may be from wide range of subjects. For example: - Biodiversity, Social subjects, Media & advertisement, Environment, Scientific, Technical, Management, Architecture, Tourism or any other subject or their combination.

The project is evaluated in two phases: Internal Evaluation & External Evaluation. This ensures descriptive assessment of the projects performance & challenges faced during the implementation of the project. The project will be spread over two semesters beginning from the odd semester (July to November) & ending in the even semester (December to May) every year. The grade obtained in this course may be used to improve the student’s semester grade point average.

The final report should include the reasons for the choice of the title, the concept, the structure, the results with working models/drawings etc. & its practicality. The role & responsibility of every individual of the group should be indicated clearly. The report should be written in the prescribed format/guidelines, certified by the faculty member & presented as a seminar.

The project is evaluated as per the approved procedure & marks obtained are computed in the even semester.
Detailed Syllabus for B.Tech. Degree Programme
in
Electronics & Communication Engineering

Semester - III

(Departmental Core Subject)

EC-262 Electronics Devices & Circuits

Objectives: To equip the students with a sound understanding of fundamental concepts of analog electronic circuits & to know the diversity of operations that the electronic circuits can perform in a wide range of applications.

Course Content
Band structure of p-n junction & current components, Quantitative theory of P-N junction diode, Volt-ampere characteristics & its temperature dependence Narrow-base diode, Transition & diffusion capacitance of P-N junction Diodes, Break down of junctions on reverse bias, Zener & Avalanche breakdowns, Tunnel diode & its V-I characteristics, Use of diodes in rectification circuits, Clipping & clamping circuits, PNP & NPN junction transistors, Characteristics of the current flow across the base regions, Minority & majority carrier profiles, Transistor as a device in CB & their characteristics, Transistor as a device in CE & CC & their characteristics, Transistor biasing: DC bias & stabilization, Various stabilization circuits, Thermal runaway & thermal Stability, Bias compensation Techniques, JFET & its characteristics. Pinch off voltage & drain saturation current, MOSFET- enhancement, depletion modes, FET biasing, Equivalent ckt of FET, low frequency FET Amplifiers, Transistor hybrid model using 'h' parameters, Analysis of CB,CC,CE configuration, Miller’s theorem, Darlington Emitter follower, Boot strapping Darlington pair, Cascaded BJT amplifier & RC coupled amplifier, Effect of bypass & coupling capacitors on the low frequency response of the amplifier, Transistorized
Differential amplifier, Class A & small signal analysis, Class B & small signal analysis, Class C & small signal analysis, Class AB push pull amplifier, collector efficiency of each, cross over distortion. Fundamentals, classifications & working principles of oscillators, such as, Hartley, Colpitts, Crystal, RC phase shift, Wien Bridge etc.

**List of Experiments**

1. Frequency response of CE amplifier
2. Frequency response of CC amplifier
3. H-parameters of CE configuration
4. Frequency response of common source FET amplifier
5. RC coupled single stage amplifier & determination of the gain frequency response, input & output impedances
6. Testing of diode clipping (single / double ended) circuits for peak clipping
7. Testing of clamping circuits: positive clamping/negative clamping
8. Testing the performance of BJT - RC phase shift oscillator for f0 ≤ 10 KHz
9. Testing the performance of BJT – Hartley & Colpitts oscillators for RF range f0≥100 KHz
10. Testing the performance of BJT – Colpitts oscillators for RF range f0≥100 KHz

**Text/Reference Books**

Detailed Syllabus for B.Tech. Degree Programme
in
Electronics & Communication Engineering

Semester - III

(Departmental Core Subject)

EE-257
Network Theory

L-T-P-C
3-0-0-3

Objective: This course discusses how to analyze & design different types of electrical networks used in engineering.

Course Content

Text/Reference Books
Objective: This course has been designed to create awareness among students about measurement techniques & the use of instruments for conventional & industrial measurements.

Course Content

List of Experiments
1. Characteristics of LDR with the distance of light source
2. Characteristics of thermistor resistance with temperature
3. Determination of the speed (digital) with the help of photoelectric speed transducer
4. Operation of D/A converter.
5. Operation of LVDT & its characteristics
6. Determination of angular displacement measurement using capacitive transducer
7. Determination of load measurement using strain gauge transducer
8. Operation of Inductive pick up transducer
9. Operation of piezoelectric transducer
10. Characteristics of thermocouple using thermocouple kit

Text/Reference Books
CS-258 Data Structures & Algorithms L-T-P-C 3-0-1-4

Objective: The subject deals with the concepts behind data structures, various searching & sorting operations, heap, hashing & graph problems.

Course Content

List of Experiments
1. Programs related to 1-dimensional & 2-dimensional Arrays
2. Program related to recursion
3. Program related to various types of searching algorithms.
4. Program related to various types of sorting algorithms.
5. Programs related to Various types of Link list creation
6. Programs related to Link list inserting elements, Deleting elements & counting nodes
7. Programs related to Stack
8. Program related to infix, prefix & postfix
9. Program related to Queues & various operations
10. Program related to Circular Queue & various operations
11. Program related to tree creating & various operations performed on tree
12. Programs related to graphs
13. Programs related to heap creation of min-heap or max-heap, searching etc

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - III

(Departmental Core Subject)

CS-261 Fundamentals of JAVA Programming  L-T-P-C  3-0-2-5

Objective: This course is designed to provide knowledge of the essential features of Java. This course also provides the skills required to use Java libraries in order to develop efficient applications.

Course Content
Fundamentals of Java technology, modelling concepts: abstraction, encapsulation & packages, code reusability, define class, member, attribute, method, constructor & package, API online documentation Identifiers, Keywords, Types & Flow Control, Arrays: comments, valid & invalid identifiers, keywords, eight primitive types, literals, primitive variable & reference variable, variable declaration, Object creation, initialization, reference variables, instance & local variables, initialization of an instance variables, operators, legal & illegal assignments of primitive types, Boolean expressions & their requirements in control constructs, assignment compatibility & required casts in fundamental types, use if, switch, for, while & do constructions & the labeled forms of break & continue as flow control structures in a program. Declare & create arrays of primitive, class, or array types, array initialization, multidimensional array, copying one array to another.
Classes & inheritance: Class fundamentals, declaring objects, assigning object reference variables, constructor & method overloading, static variables, methods & initializers, final classes, final methods & final variables, enumerated types, abstract classes & methods,
the this keyword, garbage collection, using objects as parameters, argument passing, returning objects, recursion, Inheritance basics, using super, creating a multi level hierarchy, method overriding, dynamic method dispatch, using abstract, using final with inheritance, the object class. Packages, Interfaces, Exceptions & Assertions: Packages, access protection, importing packages, interfaces, define exceptions, use of try, catch & finally statements, exception categories, common exceptions, defining own exceptions, assertions, appropriate & inappropriate uses of assertions, enable assertions at runtime

Multithreading: Define a thread, creating separate threads, controlling the code & data that are used by that thread, thread execution, difficulties when multiple threads share data, inter thread communication, synchronization. Console I/O & File I/O Collections & Generics Framework, GUIs Using the Swing API & Events, Networking: Code to set up the network connection, TCP/IP, use of Server Socket & Socket classes to implement TCP/IP clients & servers

**List of Experiments**

1. Programs related to class, objects, command line argument, polymorphism, inheritance & function overriding
2. Programs related to super keyword
3. Programs related to constructors, this keyword, abstract class & final keyword
4. Programs related to packages, sub packages & interface
5. Programs related to following access controls w.r.t. to class: private, no modifier, protected, public
6. Programs related to following exception handlers: try-catch, try-finally, try-catch-finally, throws & throw
7. Programs related to different String & String Buffer/String Builder methods
8. Programs related to various I/O classes, interfaces & functions
9. Programs related to serializable & transient
10. Programs related to different methods of URL & Inlet Address class
11. Programs related to TCP & UDP
12. Programs related to various AWT & Swing components
13. Programs related to multithreading using Thread class & Runnable interface

14. Programs related to synchronization

**Text/Reference Books**

Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - III

(Humanities & Basic Sciences Subject)

MA-251
Mathematics - III

Objective: In this course the student is familiarized with some important Mathematical techniques used in various branches of engineering.

Course Content
Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - III

(Humanities & Basic Sciences Subject)

HU-251 L-T-P-C
Business & Technical Communication - I 1-1-0-2

Objective: To develop persuasive & professional communicative competence.

Course Content
Presentation Skills: Types of presentation; Effective strategies for oral presentations - audience analysis; organizing contents & use of media; Awareness of body language, time & space; Tone, variety of pitch, rate, volume & Articulation.
Technical Report Writing: Characteristics & structure of a formal report; Classification & types of reports; Organization, Analysis & Interpretation of data; Revising & Editing especially in areas like abstracting/ summarizing as well as citations, references & bibliographies, check list for reports.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - IV

(Departmental Core Subject)

EC-256
Analog Communication

Objective: This course provides an introduction to modern communication systems, including AM & FM radio. The goal of teaching this course is to make the students understand the basic principles that are involved in the analysis & design of analog communication system.

Course Content

Representation of signals & systems in a communication system: Discrete & continuous spectra of signals, concepts of modulation & frequency translation, low pass & band pass signals & channels, concept of complex envelope, Hilbert transform & phase shifting; Continuous wave (CW) modulation: AM, DSB/SC, SSB, VSB, methods of generation; Demodulation techniques of CW modulation: coherent & non-coherent; Nonlinear modulation techniques: FM & PM, narrowband FM, wideband FM, methods of generation; FM spectrum; Demodulation techniques for FM; Frequency Division Multiplexing (FDM); Radio transmitters & receivers; Sampling a signal by periodic pulse stream: spectra of ideally sampled signal, Nyquist sampling theorem, flat-top sampling, sampling of band pass signals, examples of sampling circuits; PAM, PWM, PPM, PFM â€“ spectra, generation & demodulation schemes; Time-division multiplexing; Performance of analog modulation schemes in AWGN: CNR, post-demodulation & figure of merit for AM, DSB/SC, SSB, FM, threshold effect in FM, pre-emphasis & de-emphasis in FM, FMFB. Noise in receivers; Noise figures; Radio link design.
List of Experiments

1. Communication tool box
2. Generation of the AM wave
3. Generation of the AM wave & plot it’s frequency spectrum
4. Generation of the AM wave for different value of modulation index (m<1, m=1 & m>1)
5. Generation of the FM wave & plot the frequency spectrum
6. Generation of the amplitude modulation (AM) wave & determine its modulation Index ($m_a$)
7. Demodulation of the amplitude modulated wave
8. Generation of the frequency modulation wave
9. Demodulation of the frequency modulated wave
10. Super heterodyne AM receiver

Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - IV

(Departmental Core Subject)

EC-257
Signals & Systems
L-T-P-C
3-1-0-4

Objective: This course discusses continuous/discrete time signals & systems which are the basic tools used in analysis of the frequency & transform domain method.

Course Content

Introduction to signals & systems; Review of Fourier & Laplace Transforms; LTI system: Causality, stability, region of convergence; Classification & representation of signals, Concepts of linear vector space & orthogonal signal representation; Discrete signals: Sampling, digitization & reconstruction of analog signals; Fourier transform of discrete signals: DFT, z-transforms; Discrete systems, transfer functions & convolution; Random variables & processes: stationarity, ergodicity, correlation functions, power density spectra, Wiener-Khinchin theorem; functions of random signals; System response to random signals: Filtered random process a low pass & band pass; Basic concept of optimum filtering: Wiener Hopf filter.

Text/ Reference Books

Detailed Syllabus for B.Tech. Degree Programme
in
Electronics & Communication Engineering

Semester - IV

(Departmental Core Subject)

EC-258 Digital Electronic Circuits & Applications 3-1-1-5

Objective: This course is designed to develop the skill & knowledge required for designing digital circuits that are used in low cost, high speed, innovative & programmable devices for real time embedded applications.

Course Content


Minimization Techniques: The K Map Method, Three, Four & Five-Variable Map, Product-of-Sums Simplification, Don't-Care Conditions, Quine Mccluskey Method NAND & NOR Implementation, Other Two-Level Implementations.


Sequential Logic Circuits: Classifications & model of sequential circuits, latches, Flip-Flops, Level & edge triggering, Master-slave configuration, Analysis of Clocked Sequential Circuits, State Reduction & Assignment, Design Procedure, Registers & Counters, Registers-Shift Registers, Ripple Counters, Synchronous Counters, Other Counters.
Analysis & Designing Of Synchronous & Asynchronous Machines: Basic models of sequential machines, Concept of state, state diagram, state reduction through partitioning & implementation of synchronous sequential circuits, Asynchronous Sequential Logic Design.

Digital Logic Families & Programmable Logic: Characteristics of Digital ICs, TTL,ECL,MOS & CMOS digital IC families Characteristics, Comparison of Performances, Interfacing TTL & CMOS ICs, Display Drivers, Basic Concepts of Programmable Logic – PROM, EPROM, PAL, PLA.

List of Experiments

1. Verification of basic & universal logic gates
2. Designing of the half adder, full adder & verify the truth tables using logic gates
3. Designing of the half subtractor, full subtractor, & verifying the truth tables using logic gates
4. Designing & implementation of the code converter-I
5. Designing & implementation of the code converter-II
6. Designing of the 4-bit adder & subtractor, & verifying the truth tables
7. Designing & implementation of the magnitude comparator & verifying the truth tables
8. Designing & implementation of the multiplexer, & verifying the truth tables
9. Designing & implementation of the demultiplexer, & verifying the truth tables
10. Designing & implementation of the encoder, & verifying the truth tables

Text/Reference Books

Objective: To Analyze, design, & applications of modern analog circuits using integrated bipolar & field effect transistor technologies & introduce the principles of analog circuits & apply the techniques for the design of analog integrated circuit (Analog IC’s).

Course Content

**List of Experiments**

1. Introduction & familiarization with PSpice
2. Designing & verification of application of transistor as an inverter
3. Designing & verification of operation of emitter follower at high frequencies
4. Transfer characteristic of a differential amplifier
5. Operation of an op-amp in inverting & non-inverting configuration
6. Application of op-amp as summing, scaling & averaging amplifiers in inverting, non-inverting & differential configurations
7. Operation of op-amp as an integrator & differentiator
8. Operation of first order & second order low pass butterworth filter
9. Operation of first order & second order high pass butterworth filter
10. Operation of op-amp as square wave generator & triangular wave generator
11. Operation of op-amp as basic comparator & voltage limiters
12. Operation of op-amp as positive clipper

**Text/Reference Books**

Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - IV

(Humanities & Basic Sciences Subject)

MA-254
Introduction to Probability Theory & Stochastic Processes

Objective: The main objective of this course is to make the students familiar with probability theory, statistics & Random Processes which have applications in Computer Science & Engineering, Electronics & Communication Engineering.

Course Content
Axioms of probability, Probability space, conditional probability, independence, Baye’s rule, Repeated trials, Bernoulli trials, Random variables: discrete r.v., probability mass functions, c.d.f., common distributions, continuous r.v., probability density & distributions of r.v., joint distributions, order statistics, expectation; moments, transforms, conditional expectations, stochastic processes, Markov chains & Markov processes (birth, death, etc.), Queuing models.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
in
Electronics & Communication Engineering

Semester - V

(Departmental Core Subject)

EC-351
Electromagnetic Engineering

L-T-P-C: 3-0-0-3

Objective: To introduce basic electromagnetics & establish the fundamentals of devices in electromagnetic applications, as required by engineers in energy systems, telecommunications, computing & other technologies.

Course Content
Maxwell's equations: displacement current, equation of continuity, boundary conditions; propagation of uniform plane waves in unbounded medium: reflection, refraction, phase & group velocities; transmission lines & waveguides: modes, design, travelling waves, standing waves, pulse propagation, characteristic impedance, cut-off frequency, attenuation, dispersion, power-handling capability; Smith chart & impedance matching techniques; radiation concept: elementary dipole, half-wave dipole, radiation patterns, gain, pattern multiplication, other basic antennas.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - V

(Departmental Core Subject)

EC-352
Digital Signal Processing

L-T-P-C 3-1-1-5

Objective: This course discusses the methods of analyzing discrete time signals & systems, & the methods required for transforming & processing digital signals used in high speed speech & image processing.

Course Content

List of Experiments
1. Verification of the sampling theorem
2. Impulse response of a given system
3. Linear convolution of two given sequences
4. Circular convolution of two given sequences
5. Autocorrelation of a given sequence & verification of its properties
6. Cross correlation of given sequences & verification of its properties
7. Solving a given difference equation
8. Computation of N point DFT of a given sequence & plotting of the magnitude & phase spectrum
9. Linear & circular convolution of two sequences using DFT & IDFT
10. Implementation of FIR & IIR filter to meet given specifications

Text/Reference Books
Objective: This course introduces the working principles of digital communication systems, source digitization, digital multiplexing & modulation, which are required for customizing communication systems.

Course Content
Digital signals & their spectra; Concepts of information & entropy; Source coding: Coding theorem, fixed length codes; variable length codes; Quantization of signals; Waveform coding techniques: PCM, DPCM, ADPCM, DM, ADM; Baseband transmission: intersymbol interference, noise, eye pattern, BER analysis, Optimum filtering, equalization techniques; Clock recovery; Line coding techniques: Binary & multilevel line codes; Digital modulation schemes: Binary modulation schemes- ASK, PSK, FSK, DPSK; M-ary modulation schemes: QPSK, /4 QPSK, MSK; QAM: generation & demodulation schemes, carrier recovery techniques, BER analysis of digital modulation systems; Shannon's capacity theorem & spectral efficiency of digital modulation schemes.

List of Experiments
1. Sampling & reconstruction of an analog signal
2. Generation of the PAM, PWM & PPM signal & their demodulation
3. Generation of the TDM-PAM signal & its demodulation
4. Generation of the PCM signal & its demodulation
5. Experimentation on delta modulation & demodulation
6. Different types of digital data formats (RZ, NRZ & Manchester)
7. Experimentation on the ASK modulation & demodulation
8. Experimentation on the FSK modulation & demodulation
9. Experimentation on the BPSK modulation & demodulation
10. Quadrature amplitude modulation & demodulation

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - V

(Departmental Core Subject)

EC-354 Microprocessors L-T-P-C 3-0-1-4

Objective: This course helps students to understand the different aspects of hardware, peripheral interfaces & programming which are required for developing low cost software based applications.

Course Content
A block diagram view of a general purpose processor; elements of hardware & software architectures; introductory data & control paths concepts, registers & memory organization. Instruction set basics & assembly language programming: Instruction structure & addressing modes, instruction encoding, detailed study of 8085A instruction set & interfacing basics: memory interfacing, principles of I/O interfacing, polled & interrupts I/O handshaking principles. Examples of I/O devices: parallel port, serial port, keypad, display, etc. Introductory microcontrollers. Laboratory: Supplements the theory 8085-microprocessor kit based experiments: Software experiments demonstrate the use of the instruction set & assembly language programming. Hardware experiments for memory interfacing, parallel port, serial ports, interrupt driven I/O Simple microcontrollers based experiments.

List of Experiment
1. Microprocessor 8085 kit
2. Writing an assembly language program to add two 8-bit numbers without carry
3. a) Writing an assembly language program to add two 8-bit numbers with carry
   b) Writing an assembly language program to subtract two 8-bit numbers without borrow
   c) Writing an assembly language program to subtract two 8-bit numbers with borrow
4. Writing an assembly language program to add two 16-bit numbers with carry
5. Writing an assembly language program to subtract two 16-bit numbers with borrow
6. a) Writing an assembly language program to move data block starting at location 'X' to location 'y' without overlap (direct process)
   b) Writing an assembly language program to move data block starting at location 'X' to location 'y' without overlap (reverse process)
7. a) Writing an assembly language program to move data block starting at location 'X' to location 'y' with overlap (direct process)
   b) Writing an assembly language program to move data block starting at location 'X' to location 'y' with overlap (reverse process)
8. Writing an assembly language program for array of 8-bit numbers in ascending order using 8085 microprocessor
9. Writing an assembly language program for array of 8-bit numbers in descending order using 8085 microprocessor
10. Writing an assembly language program to implement multiplication by successive addition method
11. Writing an assembly language program to implement division of two 8-bit numbers using repeated subtraction method
12. Writing an assembly language program to add two BCD numbers
13. Writing an assembly language program for HEX to ASCII character conversion
14. Writing an assembly language program for ASCII to HEX conversion
15. Writing an assembly language program for ASCII to HEX conversion

Text/Reference Books
Objective: This course discusses the basic concepts of linear control systems, their analysis & design.

Course Content
Modeling of physical systems: time-domain, frequency-domain & state-variable models; block diagram, signal flow graph & Mason’s gain formula; & frequency response of first & second order systems; control system characteristics: stability, sensitivity, disturbance rejection & steady-state accuracy; stability analysis: Routh-Hurwitz test, relative stability, root locus, Bode & Nyquist plots; controller types: lag, lead, lag-lead, PID & variants of PID; controller design based on root-locus & frequency response plots; modern design techniques: canonical state-variable models, equivalence between frequency & time-domain representations, diagonalisation, controllability & observability, pole placement by state feedback, state feedback with integral control, observer & observer based state feedback control.

List of Experiments
1. Characteristics of a synchro transmitter-receiver pair & use these as a torque synchro & angular error detector
2. Performance characteristics of an angular position error detector using two potentiometers
3. Performance characteristics of a DC motor angular position control system
4. Study the performance of various types of controllers used to control the temperature of an oven
5. Performance characteristics of an analogue PID controller using simulated systems
6. Designing implement & study the effects of different cascade compensation networks for a given system
7. Characteristics of a small a.c. servomotor & determine its transfer function
8. Time response of a variety of simulated linear systems & to correlate studies with theoretical results
9. Determination of the poles & zeros from the given transfer function & show the pole zero configuration in s-plane
10. Drawing of the root locus for given transfer function
11. Determine % unit step response of the system whose close loop transfer function is given
12. Determination of undamped natural frequency, % damping ratio, % overshoot of the response of a system whose open loop transfer function with unity feedback is given to a unit step input
13. Sketching of the bode plot for the given transfer function

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VI

(Departmental Core Subject)

EC-355 RF & Microwave Engineering

Objective: This course familiarizes students with the devices used in RF & microwave engineering & helps to develop an understanding of customized system interfacing.

Course Content
S-matrix: representation, properties, shift in reference planes, generalized S-matrix; wave propagation in planar lines: design, effective dielectric constant, attenuation, dispersion, power-handling capability; lumped elements & their design; passive components: operation & S-matrices of resonators/cavities, directional couplers, power splitters/combiners, filters; non-reciprocal components: isolators & circulators; microwave sources: tube type, transistor amplifier & oscillator design, Gunn oscillator; microwave systems.

List of Experiments
1. Familiarization of various microwave components & instruments like frequency meter, attenuator, detector & VSWR meter
2. Drawing V-I characteristics of microwave source like Reflex Klystron. Measurement of klystron characteristics
3. Measurement of Gunn characteristics & proof drawing of the following characteristics of Gunn Diode:
   (i) Output power & frequency as a function of voltage
(ii) Square wave modulation by PIN diode

4. Measurement of frequency & guided wavelength in TE10 rectangular waveguide

5. Measurement of impedance in a wave guide

6. Measurement of VSWR (small as well as large values) & reflection coefficient. Determination the use of slide screw tuner to achieve a match

7. Determination of the action of directional coupler, measurement of directivity & coupling coefficient of a directional coupler & its use in separating incident & reflected wave

8. Determination of radiation characteristics & gain of an antenna & draw polar pattern of H-plane sectorial Horn

9. Determination of radiation characteristics & gain of an antenna & draw polar pattern of E-plane sectorial Horn

10. Characterization of magic tee, E-plane, H-plane tee, by measuring power using microwave power meter

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VI

(Departmental Core Subject)

EC-356
VLSI Engineering

L-T-P-C
3-0-1-4

Objective: To enable the students to design combinational & sequential circuits using CMOS gates, identify the sources of power dissipation in a CMOS circuit & analyze SRAM cell & memory arrays.

Course Content

Introduction: Design hierarchy, layers of abstraction, integration density & Moore’s law, VLSI design styles, packaging styles, design automation principles; Fabrication Technology: Basic steps of fabrication, bipolar, CMOS & Bi-CMOS fabrication processes, layout design rules; MOS & Bi-CMOS characteristics & circuits: MOS transistor characteristics, MOS switch & inverter, Bi-CMOS inverter, latch-up in CMOS inverter, super-buffers, propagation delay models, switching delay in logic circuits, CMOS analog amplifier; Logic Design: switch logic, gate restoring logic, various logic families & logic gates, PLA; Dynamic Circuits: Basic concept, noise considerations, charge sharing, cascading dynamic gates, domino logic, np-CMOS logic, clocking schemes; Sequential Circuits: Basic regenerative circuits, bistable circuit elements, CMOS SR latch, clocked latch & flip-flops; Low-power Circuits: low-power design through voltage scaling, estimation & optimization of switching activity, reduction of switched capacitance, adiabatic logic circuits; Subsystem Design: design of arithmetic building blocks like adders, multipliers, shifters, area-speed-power tradeoff; Semiconductor Memories: SRAM, DRAM, non-volatile memories; Bipolar ECL Inverter: Features of ECL gate, robustness & noise immunity, logic design in ECL, single-ended & differential ECL gates;
Testability of VLSI: Fault models, scan-based techniques, BIST, test vector generation; Physical Design: Brief ideas on partitioning, placement, routing & compaction.

**List of Experiments**
1. Designing of a 3 input NAND gate using gate level
2. Analysis of various types of CMOS inverter
3. Designing of XOR using CMOS logic
4. Designing of Multiplexer circuits using CMOS logic
5. Designing of full adder & subtractor using gate level
6. Designing a flip-flop using gate level
7. Designing of logic gates using transmission gates
8. Designing of various multiplexer using transmission gates
9. Designing of circuits using dynamic logic family
10. Designing of various types of decoders

**Text/Reference Books**
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VI

( pride of Departmental Core Subject)

EC-357 Embedded Systems 3-0-1-4

Objective: The objective of teaching this course to the student is to train them to learn all aspects of hardware & software development to design embedded system for various applications.

Course Content
systems: I2C bus, CAN bus; examples. Case studies: Inkjet printer, telephone exchange, etc.

List of Experiments

1. ARM7 LPC2148 Trainer kit
2. Keil IDE overview – project creation, downloading & debugging
3. Writing an assembly language program for assembler directives & factorial calculations
4. Writing an assembly language program for swapping of register contents, comparison along with loop & shifting of data
5. Writing an assembly language program for addition of two 32-bit numbers use of subroutine.
6. Writing an assembly language program for copy block
7. Writing an assembly language program for Hex to ASCII conversion
8. Writing an assembly language program for larger of two numbers
9. Writing an assembly language program for GPIO programming
10. Writing an assembly language program for copy of word & stack operation
11. Programming examples on the ARM LPC2148 trainer kit

Text/Reference Books

Objective: This course introduces optical principles & optical fibers which are a fundamental component of networks.

Course Content
Introduction to optical communications systems, Brief overview of optical fibres, sources & photodetectors; Optical transmitters: LED driver circuits: saturated transistor & emitter-coupled configurations, Laser driver circuits mean & peak power control circuits, temperature control circuits; Optical receivers using direct detection: PIN-based receivers, APD-based receivers, Receiver noise processes, Receiver circuits: preamplifiers – Trans impedance & high-input-impedance amplifiers; Digital optical communication links: BER in quantum limit, BER analysis for PIN-based & APD-based receivers in presence of shot & thermal noise components, Link design Power budget & rise-time budget, Line coding schemes; SONET/SDH: Limitations of PDH multiplexing, SONET/SDH layers, SONET/SDH frame structure, SONET/SDH physical layer, Elements of SONET/SDH infrastructure; Analog optical communication links: RIN, SNR analysis & limiting conditions, Multi channel AM & FM, Sub carrier multiplexing; Elements of coherent optical communication systems: Fundamental concepts & requirements for lasers, Frequency alignment & polarization control schemes, PSK, FSK, DPSK generation & demodulation techniques.
List of Experiments

1. Setting up the fiber optic analog link & also observe Intensity Modulation System using analog input signal
2. Setting up the fiber optic digital link & also observe Intensity Modulation System using digital input signal
3. Frequency modulation system on optical communication trainer
4. Pulse width modulation system on optical communication trainer
5. Calculation of the fundamental parameters for step index fibers (numerical aperture, acceptance angle, solid acceptance angle, propagation constant)
6. Calculation of the fundamental parameters for step index fibers (propagation constant ($\beta$), normalized propagation constant ($b$), $V$ number ($V$). Checking of the fiber is in single mode or multi mode. Graphical representation between normalized propagation constant ($b$) & $V$ number, cut off wavelength ($\lambda_c$), number of modes traveling in fiber ($M_s$))
7. Calculation of the fundamental parameters for graded index fibers (graphical representation of core refractive index $n_1[r]$ with respect to radius ($a$) of core for different profile parameters. Graphical representation of numerical aperture numerical aperture [$r$] with respect to radius of core ($r$) for different profile parameters, acceptance angle ($\theta_a$) for given value of radius
8. Experiment on the location where $0 < r <= a$, $\Delta$ = refractive index difference
9. Calculation of the fundamental parameters for graded index fibers (numerical aperture (NA), $V$ number ($V$). Checking of the fiber is in single mode or multi mode. Graphical representation between $V$ number & wavelength ($\lambda$) cut off wavelength ($\lambda_c$), number of modes traveling in fiber ($M_s$)
10. Propagation loss in optical fiber using optical communication trainer
11. Bending loss in optical fiber using optical communication trainer
12. Measurement of numerical aperture in optical fiber using optical communication trainer
13. Characteristics of optical communication links using optical communication trainer

**Text/Reference Books**
Objective: Power electronics are used in industry for industrial drive & control applications. This course familiarizes students with the working principles of power semiconductor devices, power converters, inverters, choppers, cycloconverters & their applications in industries.

Course Content
Power Semiconductor Devices: Diode, BJT, MOSFET, SCR, Triac, GTO, IGBT, MCT & their V-I characteristics, ratings, driver circuits, protection & cooling; AC-DC Converters (Rectifiers): Diode rectifier, thyristor based rectifier, effect of source inductance, single/three phase rectifiers, semi/full rectifiers, power factor, harmonics; DC-AC Converters (Inverters): Concept of switched mode inverters, PWM switching, voltage & frequency control of single/ three phase inverters, harmonics reduction, other switching schemes - square wave pulse switching, programmed harmonic elimination switching, current regulated modulation switching - tolerance band control, fixed frequency control; voltage source inverter (VSI), current source inverter (CSI); DC-DC Converters (Chopper): Principle; buck, boost & buck-boost converters; AC Voltage Controllers: Principle of ON-OFF control & phase control, single/three phase controllers, PWM AC voltage controller, cycloconverters; Electric drives: introduction & classification. DC motor drives: speed-torque characteristics of shunt, series, PMDC motors; dynamic models;
speed & position control methods; AC motor drives: d-q model of induction motor; constant flux speed control structure; vector control model; vector control structure.

**List of Experiments**

1. SCR characteristics - V-I characteristics of SCR & determination of the break over voltage, holding current & latching current

2. TRIAC characteristics - V-I characteristics of a TRIAC in both directions & also in different (1, 2, 3 & 4) modes of operation & determination of break over voltages, holding current & latching current

3. DIAC characteristics - characteristics of DIAC

4. R triggering circuit of SCR– evaluation of the synchronized pulses to turn on SCR in full wave rectifier with resistive load, displaying of the load voltage & triggering pulse waveform & plotting of the average DC voltage with respect to delay angle

5. RC triggering circuit of SCR– evaluation of the synchronized pulses to turn on SCR in full wave rectifier with resistive & inductive load, displaying of the load voltage & triggering pulse waveform & plotting of the average DC voltage with respect to delay angle

6. UJT triggering circuit of SCR - performance & waveforms of UJT triggering of SCR

7. Single phase half wave controlled rectifier - performance & waveforms of single phase half wave controlled rectifier

8. Single phase fully controlled bridge rectifier - performance & waveforms of single phase fully controlled bridge rectifier

9. Simulation problems on DC-DC converters (Choppers)

10. Simulation problems on DC-AC converters (Inverters)

**Text/Reference Books**


Objective: This course helps students to understand how electromagnetic waves travel from the transmitter to the receiver & how the antenna converts electrical energy into electromagnetic waves. The various types of transmitting & receiving antennas are also discussed.

Course Content

List of Experiments
1. Antenna trainer kit, its components, controls & features
2. Introduction to various characteristics of antennas. Arranging the trainer & performing the functional checks
3. Use of the matching stub provided with this trainer kit for VSWR measurement & antenna current sensor
4. Antenna & plotting of the radiation pattern for simple dipole l/4 antenna & Folded dipole l/2 antenna
5. Antenna & plotting of the radiation pattern for Yagi UDA 3 element folded dipole & Yagi UDA 5 element folded dipole

6. Antenna & plotting of the radiation pattern for Yagi UDA 5 element simple dipole & Yagi UDA 7 element simple dipole

7. Antenna & plotting of the radiation pattern for Hertz antenna & Zeppelin antenna

8. Antenna & plotting of the radiation pattern for \( \frac{\lambda}{2} \) phase array, \( \frac{\lambda}{4} \) phase array, combined co-linear array & broad side array

9. Antenna & plotting of the radiation pattern for Log periodic antenna & Cut Paraboloid reflector antenna

10. Antenna & plotting of the radiation pattern for Loop antenna & Rhombus antenna

11. Antenna & plotting of the radiation pattern for Ground plane antenna, Slot antenna & Helix antenna

Text/Reference Books


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Semester - VII

(Departmental Core Subject)

EC-452 Mobile Communication

L-T-P-C: 3-0-1-4

Objective: The demand & importance of mobile communication is fast expanding. This course introduces the basic architecture for mobile & cellular devices starting from 1G through 3G.

Course Content
Representation of a mobile radio signal; propagation path loss & fading: causes, types of fading & classification of channels; prediction of propagation loss: measurements, prediction over flat terrain, point-to-point prediction, micro cell prediction model; calculation of fades: amplitude fades, random PM & random FM, selective fading, diversity schemes, combining techniques, bit error-rate & word-error-rate; mobile radio interference: co-channel & adjacent-channel interference, intermodulation, intersymbol & simulcast interference; frequency plans: channelized schemes & frequency reuse, FDM, TDM, spread spectrum & frequency hopping, cellular concept, spectral efficiency; design parameters at base station: antenna configurations, noise, power & field strength; design parameters at mobile unit: directional antennas & diversity schemes: frequency dependency; noise; antenna connections; field component diversity antennas; signalling & channel access: word-error-rate, channel assignment; cellular CDMA: narrow band & wide band signal propagation, spread spectrum techniques, capacities of multiple access schemes; micro cell systems: conventional cellular system, micro cell system design, capacity analysis.
List of Experiments

1. Direct spread spectrum based (DSSS) based modulation & demodulation
2. CDMA-DSSS technique in a two users / two channels environment
3. Frequency hopping spread spectrum (FHSS) modulation & demodulation technique
4. Importance of frame synchronization signal in receiving the correct output at correct output channel
5. Interconnect of the various functional blocks & observation of the overall effect of the individual parameter/ mode on the communication system (complete TDM PAM system)
6. Observation of the output waveforms at receiver channels, CH1/ CH2/ CH3 on oscilloscope & observe preservation of DC level in output waveform compared to input signal
7. Frequency Division Multiplexing/ de-multiplexing with sinusoidal wave
8. Frequency Division Multiplexing/De-multiplexing with audio input
9. Observation of the received power by the use of FRIIS transmission formula with different path loss exponent
10. Observation of the received power by the use of FRIIS transmission formula in log – distance / log – normal shadowing path loss model & free space path loss model

Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Departmental Core Subject)

CS-463 Programming Concepts

L-T-P-C 0-0-1-1

Objective: This course is designed to provide knowledge of the essential features of C, C++, Java Texts/Reference Books Excel.

Course content
Decision making statement & operator based programs, Loop based programs, Multi way decision making statement based programs, Array, String, Function, Structures, Pointers, Files, Imperative Languages, Functional programming, data abstraction, polymorphism, semantics, implementation issues, Declarative programming, Object-oriented programming with objects, classes & instances, Programming concepts in JAVA, advanced applications in Excel

List of Experiments

1. Decision making statement & operator based programs
2. Loop based programs
3. Multi way decision making statement based programs
4. Array & string based programs
5. Function based programs
6. Structure based programs
7. Pointers based programs
8. File handling based programs
9. Programs related to classes & objects
10. Programs related to constructors & destructors
11. Programs related to operator overloading & type conversion
12. Programs related to Inheritance
13. Programs related to virtual functions & polymorphism
14. Programs related to managing data files
15. Programs related to exception handling
16. Programs related to class, objects, command line argument, polymorphism, inheritance & function overriding
17. Programs related to following access controls w.r.t. to class: private, no modifier, protected, public
18. Programs related to various I/O classes, interfaces & functions
19. Programs related to synchronization
20. Hands on practicals in Excel

Text/Reference Books
In the Summer Internship, each student undergoes training in an Industry for a minimum period of six weeks during the summer vacation after VI Semester. Through the internship students are exposed to various processes involved in an industrial unit such as, construction, operation & maintenance etc. & have the opportunity to relate with the knowledge they acquired in the classroom. Students may also execute small projects as part of the internship under the supervision of competent personnel in the industry & faculty members of the university. On completion of the internship, students are required to prepare a report based on the activities performed during the internship, duly certified by the supervisors, & present the same in the form of a seminar in Semester VII. Evaluation of the Summer Internship for the allotted credits will be done as per the approved procedure.
Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Departmental Core Subject)

EC-455 L-T-P-C
Comprehensive Viva Voce 0-0-0-2

The knowledge gained by the students during their B.Tech programme will be evaluated through a Comprehensive Viva Voce held in the VII Semester. The test will cover the entire syllabi of the B.Tech degree programme. Preparations for the Comprehensive Viva Voce will also help the students in their placement activities. The evaluation will be done as per the approved procedure.
Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Departmental Core Subject)

EC-460                     L-T-P-C
Minor Project              0-0-3-3

Students undertake project work to develop the skill & aptitude of problem-solving. The project work is divided into two parts: Minor & Major. The Minor project is to be undertaken in Semester VII.

Students will choose an area of their interest in consultation with a faculty member of the department, who will act as the Supervisor. The area of interest could be confined to his/her discipline or may be interdisciplinary.

The project work will involve all or some of the following processes: identification of problem, study of related literature, data collection & analysis, theoretical formulation, fabrication, experimentation & result analysis.

The preliminary work such as problem identification through literature survey, field survey etc. & preparation of plan of execution should be complied in the form of a report. The report, duly certified by the Supervisor, should be submitted to the Head of the Department.

Progress made by students will be continuously monitored & evaluated as per the approved procedure.
Objective: The explosive growth of the “Internet of Things (IoT)” is changing our world & the rapid drop in price for typical IoT components is allowing people to innovate new designs & products at home & office environment. This course provides an overview of key concepts & challenges related to digital transformation. The course examines the evolution of the Internet & how the interconnection of people, processes, data & things is transforming every industry. In this course, the importance of IoT in society, the current components of typical IoT devices & trends for the future, IoT design considerations, constraints & interfacing between the physical world & IoT devices will be covered. The course all covers how to make design trade-offs between hardware & software, key components of networking to ensure that students understand how to connect their device to the Internet. This course helps students to understand the concepts of Internet of Things so that they can be able to build IoT applications.

Course Content
Introduction – Concepts & Technologies behind Internet of Things (IOT):
Welcome to IoT, Elements of IoT, Introduction to the IoT Systems, Introduction to configuring things, Network of physical objects embedded with sensing, Programming in IoT, Prototyping, systems & interconnection, Prototyping ideas for IoT & study with case studies, Embedded Systems, Computer Networks, M2M (Machine to Machine
Communication, Internet of Everything (IOE), Concepts & Definitions: Identification, localization, wireless protocols, data storage & security; Collecting, communicating, coordinating, & leveraging the data from connected devices; Understand how to develop & implement IOT technologies, solutions, & applications. Machine Learning, Distributed Computing, Artificial Intelligence, Transitioning to the IoT, IoT connections, Implementing an IoT solution, security in IoT, Modeling an IoT solution, M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, M2M to IoT – A Market Perspective— Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain & global information monopolies, A use case example, Differing Characteristics.


Programming Languages & IDEs: Java interfacing, Python for IOT implementations. Assembly, C/C++, Python / IDLE, Pycharm, Micro python, LUA.


Optimizing power consumption of IOT Devices: Power consumption of IoT, hardware components, application & communication protocols, configuring extended battery life, Performance & power consumption, Selections of MCUs & communication interfaces, Power management plan of the IOT device addressing complexities at various level, Application’s complexities, Computing system’s complexities – Microprocessor architecture, Communication system's complexities.


List of Experiments

1. Introduction to IoT devices
2. Characteristics of IoT devices
3. Physical design of IoT devices
4. Logical design of IoT
5. Functional blocks of IoT devices
6. Communication models & APIs
7. Bay Area Rapid Transit (BART) API using Python, JavaScript & jQuery
8. Introduction to Python
9. Introduction to Software define Network (SDN)
10. Network & Communication aspects of IoT
11. Wireless medium access issues of IoT
12. MAC protocol survey & Survey routing protocols
13. Sensor deployment & Node discovery of IoT
14. Data aggregation & dissemination of IoT
15. Design challenges in IoT
16. Development challenges in IoT
17. Security challenges in IoT
18. Domain specific applications of IoT
19. Home automation using IoT
20. Industry applications using IoT
21. Surveillance applications using IoT
22. Developing IoT devices using visual programming & python
23. Introduction to different IoT tools
24. Developing applications through IoT tools
25. Developing sensor based application through embedded system platform
26. Implementing IoT concepts with python
27. Analyze IoT Process using controlled system
28. Open & closed loop control system
29. Process diagram of IoT using sensors, actuators & Microcontrollers
30. PL-App with Arduino & Raspberry Pi
31. Introduction to Cisco Meraki - Cloud-Managed Security
32. Power plant Earthquake Emergency Shutdown System - Case study on IoT
33. Record sunrise & sunset using IFTTT - case study on IoT application development
34. Representational State Transfer (REST) & Activity Streams
35. Project work on IoT

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Humanities & Basic Sciences Subject)

HU-451
Interview Skills
L-T-P-C
0-0-1-1

Objective: To understand the intricacies of interview & develop skills to perform satisfactorily.

Course Content
SWOT Analysis.
Significance of Etiquette, Grooming, Kinesics, Paralanguage & Proxemics in interviews.
Résumé, Cover letter, Thank you Letter, Job Acceptance Letter.
Interview types, Open-ended, Behavioural & Hypothetical questions, FAQs.
Group Discussion & Interview sessions.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VII

(Humanities & Basic Sciences Subject)

MA-454
Quantitative Aptitude

L-T-P-C: 0-1-0-1

Objective: To introduce certain topics from quantitative aptitude with emphasis on analytical ability & computational skills needed in competitive examinations. This module would also train the students to solve quantitative aptitude problems during the placement drives.

Course Content
Problems on Alligation or mixture.
Problems on Ages.
Problems on Clock.
Problems on Calendar.
Problems on Speed, Time & distance.
Problems on Time & Work.
Problems on Heights & distances.
Problems on Trains.
Problems on Boats & Streams.
Problems on Pipes & Cisterns.

Text/Reference Books
Objective: The aim of this course is to sensitize students towards professional ethics, fairness issues & their critical aspects as they are emerging in knowledge based economies. The ethical issues impacting professionals include intellectual property related issues that are need of modern industrial & business enterprises.

Course Content
Role of Corporations: Some big changes in the world in last 60 years (WW II, GATT, WTO) & impact on business, Need for strategic planning & process management, Business strategies & challenges in leading global organizations.
Quality Management: Quality as a strategic imperative, Evolution of quality management, Distinction between quality control, quality assurance & quality management, International standards (ISO family of standards) & International models for quality management, quality in services, enhanced focus on accreditation, the accreditation process, standards for key services (food processing: HACCP & education: NAAC).
Ethics & Human Values: Ethics & morals values, Ethical theories, Common features of unethical companies & leaders, Professional ethics, Professional Codes of Ethics, Benefits & limitations of code of ethics, Corporate social responsibility & its business implications.
Intellectual Property Issues: Protecting the intangible, Evolution of knowledge as property, What are Intellectual property rights, Classification of intellectual property, Role of WTO &
WIPO, The patenting process, Patent infringement, Copyrights, Requirements for registration of a copyright, Copyright infringement. Fair use of copyrighted material, Trade secrets, Reverse engineering, Protecting software.
Environmental & Health Concerns: Introduction, Manufacturing in the 21st century, Resource conservation, the social costs of environmental destruction (land, water & air pollution), ISO 14000 standards & approaches to environmentally friendly technology, carbon trading, international treaties & their limitations.

Text/Reference Books
After completion of the Minor Project, students shall undertake the Major Project in the Semester VIII. The idea conceived in the Minor Project shall be executed in this semester under the supervision of the faculty member. Students shall complete the practical aspect of the project. Thereafter they will prepare a report incorporating the results, their analysis & interpretation. The report, duly certified by the Supervisor, should be submitted to the Head of the Department. Progress made by the student will be continuously monitored & evaluated as per the approved procedure.
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VI

(Departmental Elective - I)

EC-361 Information Theory & Coding Techniques 3-0-0-3

Objective: This course provides an introduction of information theory, the fundamentals of error control coding techniques & their applications, & basic cryptography.

Course Content
Sources-memoryless & Markov; Information; Entropy; Extended sources; Shannon's noiseless coding theorem; Source coding; Mutual information; Channel capacity; BSC & other channels; Shannon’s channel capacity theorem; Continuous channels; Comparison of communication systems based on Information Theory; Channel Coding; Block & convolutional codes; majority logic decoding; Viterbi decoding algorithm; Coding gains & performance.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
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Electronics & Communication Engineering

Semester - VI

(Departmental Elective - I)

EC-362   L-T-P-C
Satellite Communications Systems   3-0-0-3

Objective: This course provides an in-depth understanding of different concepts used in a satellite communication system & explain the tools necessary for the calculation of basic parameters in a satellite communication system.

Course Content
Evolution & growth of communication satellites, Kepler’s laws of motion, orbits, altitude control; Satellite launch vehicles; Ariane, SLV space shuttle; Sub systems of communication satellite; Spectrum allocation & Bandwidth considerations; Propagation characteristics, Satellite transponders & other sub systems; Earth station technology; Analog & Digital link design; Multiple access techniques: FDMA, TDMA, SS-TDMA; Interference in FDMA systems.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
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Electronics & Communication Engineering

Semester - VI

(Departmental Elective - I)

EC-363
Telecommunication System Modeling & Simulation

L-T-P-C 3-0-0-3

Objective: This course provides the knowledge of modeling the random variables & random process applied to telecommunication system & to learn the methods of system simulation & performance evaluation.

Course Content
Computer simulation methods, Monte-Carlo simulation; Generation of random variables; Uniform random variables; Congruential methods; Functional transformation of random variables; PNS generation; Generation of Gaussian random variables; Simulation of communication systems in time & frequency domain; Simulation of error sources in digital channels; Channel simulation, Satellite link; Optical Communication link; Importance sampling; ITU-T programming languages.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VI

(Departmental Elective - I)

EC-364 Biomedical Instrumentation L-T-P-C 3-0-0-3

Objective: This course provides an acquaintance of the physiology of the heart, lung, blood circulation & circulation respiration & to introduce the student to the various sensing & measurement devices of electrical origin to provide awareness of electrical safety of medical equipments.

Course Content
Imaging (SPECT, PET), Fluorescence Lifetime Imaging, TEM, SEM, Atomic Force Microscopy, Confocal Laser Scanning Microscopy. Data acquisition & Storage systems. Instrument interface with PC.

**Text/Reference Books**

Objective: This course introduces the neural networks as means for computational learning; & to give design methodologies for artificial neural networks to demonstrate neural network applications on real-world tasks.

Course Content
mechanics, Markov chains, Simulated annealing, Gibbs sampling, Boltzmann machine, Sigmoid belief networks, Helmholtz machine & their deterministic versions.

**Text/Reference Books**

Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Departmental Elective - II)

EC-461                  L-T-P-C
Semiconductor Device Modeling   3-0-0-3
Pre-requisite               EC-255

Objective: This course familiarizes with the physical concepts behind the operation of microelectronic devices & also covers high performance, high speed semiconductor devices used in VLSI systems.

Course Content

Text/Reference Books
Detail Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VII

(Departmental Elective - II)

EC-462 Analog VLSI Circuits
Pre-requisite

L-T-P-C 3-0-0-3

EC-255 & EC-356

Objective: This course covers the analysis & design of analog integrated circuits starting from basic building blocks to different implementations of the amplifiers in CMOS technology.

Course Content
Introduction: Analog circuits in VLSI, Overview of circuit performance comparison in Bipolar, BiCMOS & CMOS technologies; Recapitulation: Large signal & small signal models of MOS transistors, Feedback configurations & Stability theory; Amplifiers: Basic amplifier topologies & their characteristics, Cascode amplifiers, Differential amplifier with active load; Two-stage differential amplifier: Analysis for different performance parameters, Pole-zero compensation & Design; Biasing circuits: Simple & cascode current mirrors, Current reference, Voltage reference; Folded cascode amplifier; Operational amplifier; Comparator: Simple comparator, Switch-based comparator, Latch-based comparator; Oscillator: Ring oscillator, L-C oscillator, Voltage control oscillator; Phase locked loop: Building blocks in PLL, Locking characteristic of PLL & Design of PLL; Data converters: Characterization of ADC & DAC, Block diagram of SAR ADC, Design of SAR ADC, Introduction to other ADC architectures, Introduction to DAC architecture; Active Filters: Design of switched-capacitor filter, Design of Gm-C filter.
Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Departmental Elective - II)

EC-463 L-T-P-C
VLSI Technology 3-0-0-3
Pre-requisite EC-255

Objective: This course aims at understanding the manufacturing methods & their underlying scientific principles in the context of technologies used in VLSI chip fabrication.

Course Content
Semiconductor review & survey of IC processing Roadmap; Silicon crystal growth & wafer preparation; Unit Processes: Substrate cleaning, Oxidation; Doping techniques: Diffusion, Ion implementation; Pattern transfer: mask making.

Text/Reference Books
Objective: This course gives an introduction to learn & understand basic & advance concepts of nanoelectronics.

Course Content
Text/Reference Books
Objective: This course provides knowledge of semiconductors & solid mechanics to fabricate MEMS devices & to introduce different materials used for MEMS to educate on the applications of MEMS to disciplines beyond Electrical & Mechanical engineering.

Course Content
Intrinsic Characteristics of MEMS Energy Domains & Transducers Sensors & Actuators
Micro Machining: Silicon Anisotropic Etching , Anisotropic Wet Etching, Dry Etching of Silicon , Plasma Etching , Deep Reaction Ion Etching (DRIE) ,Isotropic Wet Etching ,Gas Phase Etchants ,Case studies , Basic surface micro machining processes ,Structural & Sacrificial Materials , Acceleration of sacrificial Etch , Striction & Antistriction methods LIGA Process , Assembly of 3D MEMS ,Foundry process.

Text/Reference Books
Objective: This course introduces students about the concepts for thin film coating starting from source materials to transportation & depositions related methods & technology for deposition of thin films along with introduction of physics & techniques to analyze & characterize thin film in terms of its optical, electrical, magnetic & mechanical properties.

Course Content

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
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Electronics & Communication Engineering

Semester - VIII

(Departmental Elective - III)

EC-466 L-T-P-C
Digital Image Processing 3-0-0-3
Pre-requisite EC-352

Objective: The objective of teaching this course is to provide students with the basic understanding of image processing techniques such as image acquisition, representation, compression, frequency & spatial domain transformation & applications.

Course Content
Digital image fundamentals: Visual perception, image sensing & acquisition, sampling & quantization, basic relationship between pixels & their neighborhood properties; Image enhancement in spatial domain: Gray-level transformations, histogram equalization, spatial filters- averaging, order statistics; Edge detection: first & second derivative filters, Sobel, Canny, Laplacian & Laplacian-of Gaussian masks; Image filtering in frequency domain: One & two-dimensional DFT, properties of 2-D DFT, periodicity properties, convolution & correlation theorems, Fast Fourier Transforms, Smoothing & sharpening filtering in frequency domain, ideal & Butterworth filters, homomorphic filtering; Image restoration: Degradation/ restoration process, noise models, restoration in presence of noise-only spatial filtering, linear position-invariant degradations, estimating the degradation function, inverse filtering, Wiener filtering, constrained least squares filtering, geometric transformations; Color image processing: Color models RGB, HSI, YUV, pseudo-color image processing, full-color image processing, color transformation, color segmentation, noise in color images; Morphological Image Processing: Basic operations-dilation, erosion, opening, closing, Hit-Miss transformations, Basic morphological
algorithms - boundary extraction, region filling, connected components, convex hull, thinning, thickening, skeletons, pruning, extensions to gray-scale morphology; Image segmentation: Edge linking & boundary detection, Hough transforms, graph-theoretic techniques, global & adaptive thresholding, Region based segmentation, Segmentation by morphological watersheds, motion based segmentation; Texture Analysis: Co-occurrence matrix, Gabor filter.

**Text/Reference Books**

Detailed Syllabus for B.Tech. Degree Programme
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Semester - VIII

(Departmental Elective - III)

EC-467
Embedded Systems Design
Pre-requisite

L-T-P-C
3-0-0-3
EC-354 & EC-357

Objective: This course gives an idea to learn the architecture & programming of ARM processor, to get familiar with the embedded computing platform design & analysis & be exposed to the basic concepts of real time Operating system.

Course Content
Design & Development of Embedded Systems: Analysis of design requirement, choosing OS, processor type, development platform & programming language, input/output, coding issue & code optimization, testing & debugging, verifying software on the target system, development of prototype.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in
Electronics & Communication Engineering

Semester - VIII

(Departmental Elective - III)

EC-468
Digital Voice & Picture Communication
Pre-requisites

L-T-P-C
3-0-0-3
EC-352 & EC-353

Objective: This course provides to understand the basic concepts & methodologies for the analysis, modeling of speech signal along with mechanism of speech & audio perception & to characterize the speech signal as generated by a speech production model to understand.

Course Content
Digital speech communication; Digital TV communication; Characteristics of speech signals; Characteristics of picture signals; Subjective & objective testing; Bit rates in speech & picture communication; ITU-T recommendations for speech digitization; HDTV, Low resolution TV & Videoconferencing requirements; Time domain waveform coding of speech-PCM, DPCM, ADPCM, & DM; Frequency domain waveform coding of speech-LTC, ATC; Parameter coding of speech-channel, format & LPC vocoders; Coding of monochrome & colour video signals-Transform & Adaptive transform coding; Sub band coding; Vector quantisation; Inter frame & Hybrid coding; Delayed decision & run length coding; Effects of transmission errors; Audio & Video conferencing; Video telephone.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
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Semester - VIII

(Departmental Elective - III)

EC-469 Machine Intelligence & Expert Systems 3-0-0-3

Objective: This course introduces the practical artificial intelligence emphasizing practical applications, knowledge based expert computer systems & to acquire an understanding of application, capabilities, & limitations of expert computer systems.

Course Content

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VIII

(Departmental Elective - III)

EC-476 Optical Fibers, Components & Devices

Objective: This course enables the student to understand the basic principles of operation of optical system components.

Course Content
Optical fibers: Propagation Geometrical optics approach, Wave theory approach; Fibre loss mechanisms & bandwidth; Fiber dispersion mechanisms: Intermodal & intra modal (chromatic) dispersions, Polarization mode dispersion; Fibre nonlinearities: SPM, CPM, FWM, SBS, SRS, solation propagation; LEDs: Direct band gap semiconductors, Spontaneous emission, LED structures, Internal quantum efficiency, Linearity, Radiation pattern & spectra, Modulation characteristics, Transient response; Lasers: Stimulated emission & lasing, Laser structures, Radiation pattern & spectra, Narrow-line width lasers, Modulation characteristics: Threshold current & its temperature sensitivity, Turn-on delay, Linearity;

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VIII

(Departmental Elective - III)

EC-471 Fiber Optic Technology
Prerequisite EC-351
L-T-P-C 3-0-0-3

Objective: This course is intended to bring to the students the information necessary to understand the design, operation & capabilities of fiber systems & to give clear understanding of various components such as Optical fibers, Photo-detectors, connectors, coupling devices & fiber amplifiers.

Course Content
Common glasses, optical glasses, optical fiber materials, optical fibre perform making, reaction kinetics & efficiency, instrumentation, perform characterization, fiber fabrication processes, fiber drawing & coating, jacketing & cabling, splicing, fibre parameters & characterizations, wave propagation in fiber, optical sources modulators & detectors.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - IV

(Open Elective - I)

HU-252  
Language through Literature & Films  
L-T-P-C  
0-2-0-2

Objective: To introduce the nuances of English Literature & develop reflective, creative & literary abilities.

Course Content
The Eyes Have it – Ruskin Bond  
Appro JRD- Sudha Murthy  
Bacon - Of Study; Of Youth & Age  
Douglas Malloch - Be the best of whatever you are  
Rabindranath Tagore - Where the mind is without fear  
Enhancement of emotional, creative & social quotient through viewing & discussions on selected films

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - IV

(Open Elective - I)

BM-270 Foundations of Economic Science L-T-P-C 2-0-0-2

Objective: The objective of this course is to learn completion of projects by optimizing production with limited resources & also to know infrastructure & development needs of a country & perform tasks accordingly.

Course Content

Engineers & Economics: Meaning of economics, why engineers should know economics, important basics: consumption, production, exchange, distribution & public finance, cost of production & revenue through sales

Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - V

(Open Elective - II)

HU-351
Fun with Drama
L-T-P-C 0-2-0-2

Objective: To stimulate imagination, cultural enrichment & explore multidimensional use of language through drama.

Course Content

Script writing: Story, structure, character development, dialogue, visuals & language with emphasis on critical & analytical thinking, problem-solving & communication skills
Direction: Techniques & art of play direction with emphasis on methods of actor coaching, rehearsal procedures & presentation of several scenes of varying dramatic styles
Enactment: Controlled use of body & voice, analysis & interpretation of roles, characterization & emotional projection
Analysis: Insightful analysis of various aspects of translating a play from script to stage, director’s concepts, visual composition, attention to character development & narrative structure & power of the unspoken word

Text/Reference Books

Objective: Marketing is no longer a department charged with a limited number of tasks- it is a companywide undertaking. Marketing succeeds only when all departments work together to achieve goals. The syllabus is designed to serve as an introduction to the theory & practice of marketing to the engineering students. It will help them develop competencies in the use of the modern marketing techniques & their applications in design, development & commercialization of new products & services in the rapidly changing markets.

Course Content
Introduction: Nature & scope of marketing; Importance of marketing as a business function; Marketing concepts – traditional & modern; Selling vs. marketing; Marketing mix & environment, Marketing Myopia, Consumer Behaviour & Market Segmentation: Significance of consumer behavior; Market segmentation; concepts & importance; Bases for market segmentation, Product: Concept of product, consumer & industrial goods; Product planning & development: Product life cycle concept, New Product Development, Product Differentiation & Positioning, Branding: Role of brand & its Significance, Types of Brands, Challenges for Brands, Brand Equity , Price: Importance of price in the marketing mix; Factors affecting price of a product/service, Distributions: Distribution channels; concept & role; Types of distribution channels; Factors affecting choice of a distribution channel, Communications: Techniques of promotion; Integrated Marketing
Communications; Advertising: Role & Significance. Media & their relative merits & limitations, Public Relations & Personal Selling, E-marketing management: Overview of e-commerce, E-marketing: Role of IT in marketing, E-Marketing-mix, Emerging technology trends & their implications for marketing, Social media & marketing, E-CRM & building relationship.

Text/Reference Books
Objective: A bioprocess is a specific process that uses complete living cells or their components to obtain desired products which is an importance part of biotechnology industry. This course is designed to make a learner efficient in bioprocess calculations & to impart knowledge of different technology used in bioprocess.

Course Content
Bioprocessing v/s chemical processing, Substrates for bioconversion processes Inoculum development. Process technology for production of primary metabolites: such as baker's yeast, ethanol, citric acid, amino acids, polysaccharides & plastics, Microbial production of industrial enzymes such as glucose isomerase, cellulase, amylase, protease etc. Production of secondary metabolites: penicillin & cephalosporin etc.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VII

(Open Elective - III)

CE-462  \hspace{1cm} L-T-P-C
Air Pollution & Industrial Waste Management \hspace{1cm} 3-0-0-3

**Objective:** To give understanding of air pollution & its impact, modeling of dispersion of pollutant, control measures, types of waste from different industries & their management.

**Course Content**

Air Pollutants, their sources & harmful effects on the environment; Meteorology as applied to air pollution & dispersion of air pollutants, Air quality & emission standards, Removal of gaseous & particulate matter. Sources & types of wastes; solid, liquid & gaseous wastes; Water use in industry, industrial water quality requirements; Control & removal of specific pollutants in industrial wastewaters from dairy, fertilizer, distillery, tannery, sugar, pulp & paper, iron & steel, metal plating etc.

**Text/Reference Books**

Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Open Elective - III)

CS-458 Information Retrieval L-T-P-C 3-0-0-3

Objective: This course deals with the basic information retrieval approaches to perform the various types of searching, indexing, & retrieval from structured or unstructured data, & their applications.

Course Content
Introduction: concepts & terminology of information retrieval systems, Information Retrieval vs. Information Extraction; Indexing: inverted files, encoding, Zipf's Law, compression, Boolean queries; Fundamental IR models: Boolean, Vector Space, probabilistic, TFIDF, Okapi, language modeling, latent semantic indexing, query processing & refinement techniques; Performance Evaluation: precision, recall, F-measure; Classification: Rocchio, Naive Bayes, k-nearest neighbors, support vector machine; Clustering: partitioning methods, k-means clustering, hierarchical; Introduction to advanced topics: search, relevance feedback, ranking, query expansion.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VII

(Open Elective - III)

CS-462 Management Information Systems & E-Commerce 3-0-0-3

Objective: The course aims at acquainting students with the fundamentals of Information Systems & their application in the various areas of business. It also provides an overview of the emerging domain of e-commerce, its concepts, issues & technologies.

Course Content


E-commerce: Introduction, Definition of e-commerce, emergence of Internet, commercial use of Internet, history of e-commerce, advantages & disadvantages of e-commerce.

Enabling technologies: Internet Client server applications, networks, Uniform Resource Locator (URL), search engines, software agents, Internet Service Providers (ISP), broadband technologies, Electronic Data Interchange (EDI).

Text/Reference Books
**Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering**

**Semester - VII**

(Open Elective - III)

EC-475  L-T-P-C  3-0-0-3
Computer Networks

**Objective:** *This course discusses about the principles of data communication, the functions of different layers, IEEE standards employed in computer networking & the different protocols & network components.*

**Course Content**


Data Link Layer & Data link layer protocols: Elementary data link protocols, Sliding windows protocols, Error handling, Parity Bit Check, CRC, Checksum, Hamming Code, Hamming Distance, Overview of High Level Data Link Control (HDLC) & Ethernet.

Network Layer: IP Header (IPv4 & IPv6), IP addresses – Calculating IP address & design, TCP/IP packet, ICMP, ARP, RARP, IGMP.


Application Layer (services & protocols): WWW, Hyper Text Transfer Protocol, Domain Name System (DNS), Electronic mail (SMTP, POP, IMAP), File Transfer Protocol (FTP, TFTP).

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme
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Semester - VII

(Open Elective - III)

EE- 465  L-T-P-C
Energy Conversion Process  3-0- 0-3

Objective: This course enables students to get acquainted with various energy conversion processes used in non conventional energy sources.

Course Content
Physics of photovoltaic energy conversion in P-N junctions. Effect of physical properties of photovoltaic converters; Performance characteristics of different types of photovoltaic devices; Design considerations & manufacturing processes; Regulations & efficiency of conversion. Charge carriers & thermoelectric phenomena; Thomson, Peltier, Seebeck effect; Kelvin’s relations; Thermoelectric energy conversion; Materials, size & capacity; Performance analysis & optimized design of thermoelectric devices. Physics of thermionic emission; Operation of high level vacuum & low pressure thermionic converters; Vacuum & gas-filled converters; Thermionic nuclear reactors; Heat pipes. Basic principles of Magneto hydrodynamic power generation; Hall effect; Ionization & seeding; Faraday, Segmented electrode, Hall & Cross-connected generators, Open & closed cycles; Liquid metal MHD. Fuel cells, Thermodynamics of Fuel Cells. Performance Analysis. Low, medium, high temperature Fuel Cells.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme  
Electronics & Communication Engineering  

Semester - VII  

(Open Elective - III)  

ME-465  
Solar Energy & Applications  
L-T-P-C  
3-0-0-3  

Objective: This course discusses solar energy as an important alternative to conventional sources of energy- its generation & utilization.  

Course Content  

Text/Reference Books  
PH-451
Nanotechnology

Objective: The objective of this course is to discuss why & how changes occur in the properties of bulk materials when their size approaches a billionth of a meter & to understand the basics of nanostructures, nanotubes, nano-electronic devices, nanobiotechnology, nanomachines etc.

Course Content
Basics of low dimensional (0D, 1D, 2D) structures, Quantum dots wires & wells, Nano particles-free & dispersed, Nanocrystalline & nanostructured films, Self-organized structures; Nanostructures for optical & electronics applications, Quantum dot diodes, lasers & detectors, Single electron devices & logic applications, Optical computing & Information processing; Carbon based nanostructures, Electrical, mechanical & chemical properties of carbon nanotubes, Sensors & drug delivery vehicles, Data processing; Bulk nanostructured material & Photonic crystals; Nanostructures for Magnetic applications, Giant & Colossal Magnetoresistance. Nanostructured ferromagnetism, Random Access Memories; Nanostructures for catalysis & hydrogen storage, Nanoclays, colloids & hydrogen storage nano materials. Organic & Biological nanostructures. Nanomachines & supra molecular devices.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme  
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Semester - VII

(Open Elective - III)

PH-453  
Chaos in Engineering System  

L-T-P-C: 3-0-0-3

Objective: The objective of this course is to introduce the importance of nonlinearity & its ubiquity in engineering systems. The various techniques/tools used to understand the dynamics of nonlinear systems with examples from various engineering disciplines shall be discussed.

Course Content
Introduction to chaos. Various examples of chaos in engineering systems, electrical systems (Van DerPol oscillator); Fluid mechanical systems (Lorenz equations, Aeroelastic flutter), Vibration (Duffing equation), Chemical reactions (Belousov-Zhabotinski reaction) etc. Basic concepts in the mathematical treatment of non linear systems. Note: The emphasis in this course will be on developing a physical understanding of chaotic systems. There will be computer simulation demonstration.

Text/Reference Books

Detailed Syllabus for B.Tech. Degree Programme
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Semester - VIII

(Open Elective - IV)

BT-475
Bioremediation Technology

L-T-P-C 3-0-0-3

Objective: This course is designed to learn advance technology which use microorganisms & plants to remediate polluted & contaminated sites eg. Industrial waste water, sewage etc. as well as to make students learn about emerging technologies in this area.

Course Content
General Introduction, toxic chemicals in the environment, Xenobiotic compounds, Properties, toxicity & types of toxicity, classification of toxicants in environment; atmospheric toxicants; Conventional remediation, thermal, chemical & physical processes, role of microorganisms in pollutant degradation, Bioremediation: process, classification: In situ & Ex situ bioremediation; constrains & priorities of bioremediation; evaluation of bioremediation; factors affecting process of bioremediation, methods in determining biodegradability; contaminant availability for biodegradation. Microbial remediation & phytoremediation, Impact of biotechnology on bioremediation & global application of bioremediation technologies & case studies, Emerging Environmental Biotechnologies: Bioleaching, Biosorption Biotransformation, Biomonitoring, Microbial fuel cells.

Text/Reference Books
Objective: To develop the understanding of various environmental management techniques, legal procedure in India, development of environmental friendly industries, environmental audits & concept of green buildings.

Course Content

Text/Reference Books
Objective: The course is designed to discuss the methods to simulate the statistical inferences obtained from the various datasets. The course discusses the various data analysis methods available & their usage in generating inference from the datasets.

Course Content
Introduction to probability distributions. Basics of estimation & testing of hypothesis (frequentist approach, Bayesian approach).
Different censoring schemes: Type-I, Type-II, hybrid, progressive. Different models & EM algorithm: mixture model; bivariate distributions; cure rate model; competing risk model.
Generating random sample: discrete & continuous multivariate distributions (multinomial, multivariate normal, multivariate exponential); acceptance rejection principle; Monte Carlo Markov chain (metropolis Hastings algorithm, Gibbs sampler); Convergence of MCMC: Harris irreducibility, recurrence, minorization, limit theory for Harris recurrent markov chains.
Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VIII

(Open Elective - IV)

EC-473 Robotics & Automation 3-0-0-3

Objective: This course provides an introduction with the basic concepts, parts of robots & types of robots & to make the student familiar with the various drive systems for robot & various applications of robots, justification & implementation of robot.

Course Content
Introductory Concepts: Introduction to robotics, robotics history & development, classification of robotics, robotics applications & current research trends in robotics.
Basic Components of Robotics Systems: Robotics manipulators & mechanisms actuators-pneumatics, hydraulics & electrics, sensors classifications, internal & external sensors.
Kinematics: Introduction to robotic manipulators, position & orientation of object space, robots coordinate transforms, Forward position analysis, Denavit-Hartenberg representation & parameter calculation, inverse position analysis & parameter calculation. Euler angles & computation of parameters for different robot configurations.
Statics: Force & moment balance, recursive calculation, equivalent joint torque.
Control: control techniques, second order linear system, feedback control system & performance of feedback control system, robotic joints & joint controller, non-linear trajectory control.
Motion planning: General consideration in path description & generation, Joint space planning, Cartesian space planning, position & orientation trajectory, point to point planning, continuous path generation.

Introduction to robotic vision, image representation & analysis, template matching edge detection, space analysis, prospective transformation, camera calibration, image compression techniques.

**Text/Reference Books**

Detailed Syllabus for B.Tech. Degree Programme
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Semester - VIII

(Open Elective - IV)

ME-466 Power Generation & Economics 3-0-0-3

Objective: The goal of the course is to provide a fundamental understanding of the principles of hydro-electric, steam power, gas power, nuclear power & non-conventional power along with the economy associated with them as well as the present status, growth & developments of these power plants in India & across the world.

Course Content

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VIII

(Open Elective - V)

BT-472 Bioelectronics & Biosensors

Objective: This course imparts the knowledge of Biosensors, types of biosensors & their applications in online monitoring of bioprocesses.

Course Content

Biosensors: components of biosensors, advantages & limitations; types of biosensors; biocatalysis based biosensors, bioaffinity based biosensors & microorganisms based biosensors, biologically active material & analyte. Types of membranes used in biosensor constructions. Design of enzyme electrodes & their applications as biosensors in industry such as health care & environment. Transducers in biosensors: piezoelectric, semiconductor, impedimetric, mechanical & molecular electronics based transducers. chemiluminiscence - based biosensors principles & applications; calorimetric, optical, potentiometric / amperometricconductometric / resistormetric transducers; biosensors in clinical chemistry, medicine & health care, biosensors for veterinary, agriculture & food. Low cost- biosensor for online & environmental monitoring, Molecular electronics, assembly of photonic biomolecularmemory store, information processing; commercial prospects for biomolecular computing systems.

Text/References Books

Detailed Syllabus for B.Tech. Degree Programme in Electronics & Communication Engineering

Semester - VIII

(Open Elective - V)

CS-461 L-T-P-C
Soft Computing 3-0-0-3

Objective: This course deals with soft computing concepts, neural networks, fuzzy logic, use of heuristics based on human experience, Genetic algorithm & its applications to soft computing, Optimization problems to Text Analytics.

Course Content

Text/Reference Books
Objective: This course enables students to get acquainted with various factors & control of hydro power plants.

Course Content
Types of Hydro plants subsystems of hydro plant, turbines, hydro alternates hydro plant. Auxiliaries, control of hydro power, micro hydel systems, special problems in hydro plants.

Text/Reference Books
Detailed Syllabus for B.Tech. Degree Programme  
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Semester - VIII  

(Open Elective - V)  

MA-453  
Mathematical Statistics  
Pre-requisite  

L-T-P-C  
3-0-0-3  
MA-254 & MA-451  

Objective: To introduce the fundamental techniques of Sampling, Estimation & Hypothesis testing & illustrate these techniques with applications.  

Course Content  

Text/Reference Books  
Detailed Syllabus for B.Tech. Degree Programme
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Semester - VIII

(Open Elective - V)

ME-467
Total Quality Management 3-0-0-3

Objective: This course discusses total quality is a description of the culture, attitude & organization of a company that aims to provide, & continue to provide its customers with products & services to satisfy the needs.

Course Content


Quality Management: Organization structure & design, Quality function, decentralization, Designing & fitting organization for different types products & company, Economics of quality value & contribution, Quality cost, optimizing quality cost, seduction programme. Human Factor in Quality: Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error & corrective methods. Control Charts: Theory of control charts, measurement range, construction & analysis of R charts, process capability study, use of control charts.

Attributes of Control Charts: Defects, construction & analysis off-chart, improvement by control chart, variable sample size, construction & analysis of C-chart. Defects Diagnosis & Prevention : Defect study, identification & analysis of defects, corrective measure,

**Text/Reference Books**