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To be updated from time to time

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Course Description

Title of Course: Presentation and Communication Skills
Course Code: 14B11HS111
L-T-P Scheme: 1-2-0
Credit: 3

Objective:
To develop effective presentation and communication skills that enable the students to speak, write and present in clear, correct, concise, and audience-centered manner, which has grammatical correctness, and a graceful, uncluttered style. It aims to:

- inculcate effective listening skills that enable them to comprehend instructions and become a critical listener
- augment effective oral skills that enable them to speak interpersonally
- develop active reading skills that is reading with an awareness of a purpose, and
- Instill the writing skills in a lucid style which ensures careful and nuanced textual analysis, command of primary and secondary materials, and interpretive judgment.

Course Content:

Unit I: Concept and Nature of Communication

Unit II: Listening Skills
The listening process, Importance of listening, Purpose and types of listening, Hearing and listening, Listening with a purpose, Barriers to listening.

Unit III: Oral Skills
Importance of acquiring oral skills, Visual aids, Body Language, Delivery, Pronunciation, Use of connectives Organization of matter: Metadiscourse features, Textual organization, 7 C’S of effective communication

Unit IV: Reading Skills
Skimming and Scanning, Intensive and extensive reading, SQ3R Technique

Unit V: Writing Skills
Business letters, Memo, Circulars, Notices, Report writing, resume writing, Tips on clear writing

Unit VI: Interviewing Strategies and Practices
Tips for successful job interview, Do's and don'ts while appearing for interview, Mock interview, Some interview questions, Telephonic interview tips.

Text Books:
1. K.K. Sinha- Business Communication (Galgotia Publications)
2. R.C. Bhatia- Business Communication (Ane Books Pvt. Ltd.)

Reference Books
1. Rajendra Pal - Business Communication (Sultanchand & Sons Publication).
Course Description

Title of Course: English  
Course Code: 14B11HS199
L-T-P Scheme: 2-0-0  
Credit: 0

Objective:
Enable the students to use English language as a tool for their specific professional and individual requirements.

Course Content:

Unit I: Functional English Grammar

Unit II: Vocabulary and Comprehension
Improving vocabulary by learning Root words in English. Some foreign words, Reading comprehension -1, Reading comprehension -2, Some important synonyms and antonyms.

Unit II: Conversational Skill
Speech Preparation, Theory of group discussion, Participation in Group discussion, Oral presentation, Power point presentation

Unit IV: Compositions

Unit V: Literature
Short Essay, Poem, Fiction etc.

Text Books:
1. Wren and Martin: English Grammar and Composition
2. Raymond Murphy : Essential English Grammar

Reference Books:
Course Description

Title of Course: Mathematics-I
L-T-P Scheme: 3-1-0
Course Code: 14B11MA111
Credit: 4

Objective:
To make students aware of the basic mathematical concepts and methods which will help them in learning courses in engineering and Technology

Learning Outcomes:
At the end of the course the student will have the background of mathematics necessary for understanding other courses of engineering and allied sciences.

Course Content:

Unit I: Introduction: Partial Differentiation, Taylor’s Series, Double Integrals.

Unit II: Maxima and Minima, Jacobians.

Unit III: Equations to a Line, Plane, Curve and Surfaces.

Unit IV: Line and Surface Integrals. Gradients, Divergence and Curl, Normal and Tangent to a Surface.

Unit V: Gauss and Stokes Theorems, Differential Equations With Constant Coefficients, Laplace Transform.

Unit VI: Algebra of Matrices, Determinants, Rank, Gauss Elimination Method, Eigen Values and Vectors, Quadratic Forms.

Text Books:

References Books:
1. Prasad C. Mathematics for engineers
2. Prasad Mudralaya 1992, Advanced Mathematics for engineers
Course Description

Title of Course: Physics-I
L-T-P Scheme: 3-1-0
Course Code: 14B11PH111
Credit: 4

Objective:
The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters.

Learning outcomes:
At the end of the course, the students will have sufficient scientific understanding of different phenomena associated with modern developments in Physics.

Course Content:
Unit I: Relativity:

Unit II: Elements of Quantum Mechanics:
Quantization of Radiation: Black body radiation, Wein’s law, Rayleigh Jeans law, Planck’s law of radiation, photo electric effect Compton scattering. Quantization of Matter: Atomic spectra, Bohr model of hydrogen atom, Frank hertz experiment, Matter waves, de Broglie hypothesis, Davisson Germer experiment, wave packets, phase and group velocity Heisenberg’s uncertainty principle, Schrödinger wave equation and its applications to the free particle in a box, potential barrier and Harmonic oscillator, Quantum numbers, Spin and orbital angular momentum, L-S and j-j coupling. Atoms in magnetic field, Zeeman effect.

Unit III: Statistical Mechanics:
Micro and Macro states, temperature and the partition function, Concept of Entropy, Shannon’s information entropy, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distributions and their applications.

Unit IV: Elements of Solid State Physics:
Basic ideas of bonding in solids, Crystal structure, X-ray diffraction, Band theory of solids, Distinction between metals, semiconductors and insulators.

Unit V: Lasers:
Principle and working of laser, Different types of lasers (He-Ne Laser, Ruby Laser, Semiconductor Laser), Applications of Lasers,

Text Books:
1. A. Beiser, Perspectives of Modern Physics, Tata McGraw Hill.

Reference Books:
1. J Bernstein, P M Fishbane, S Gasiorowicz, Modern Physics, Pearson Education.
2. B. B. Laud, Laser and Non-Linear Optics, New Age International (P) Ltd.
Course Description

Title of Course: Electrical Circuit Analysis  
Course Code: 14B11EC111
L-T-P Scheme: 3-1-0  
Credit: 4

Prerequisite:
Students must have previous knowledge of mathematics and physics at upper secondary school level.

Objective:
To develop the fundamental tools of linear circuit analysis which will be useful to all engineers to learn the "alphabet" of circuits, including wires, resistors, capacitors, inductors, voltage and current sources and their applications for ac and dc. To prepare students for more advanced courses in circuit analysis.

Learning Outcomes:
The course will give the basic understanding and knowledge of electrical networks and mathematical methods for analysis of linear models. The course is an essential base for further studies in many different areas where piecewise linear or linear models are used.

Course Content:

Unit I: Basic Electrical Circuits
Electromotive Force (EMF), Terminal Voltage; Resistance ($R$), Inductance ($L$) and Capacitance ($C$) from (i) Circuit, (ii) Energy, and (iii) Geometrical Points of View; Voltage Divider, Current Divider; Star-Delta Transformation; Voltage Source and Current Source, Source Transformation, Combination of Sources; Controlled (Dependent) Sources.

Network Analysis

Unit II: Network Theorems (DC)
Superposition Theorem, Thévenin’s Theorem, Norton’s Theorem, Maximum Power Transfer Theorem, Millman’s Theorem, Reciprocity Theorem, Substitution Theorem.

Transient Analysis

Unit III: Two Port Networks
Impedance ($Z$) Parameter, Admittance ($Y$) Parameter, Hybrid (h) Parameter, Transmission Parameters; Equivalent Networks, Relationship between Parameters, Interconnection of Networks.

Magnetic Circuits: Magnetomotive Force (MMF); Magnetic Field Strength; Permeability, Reluctance, Permeance; Analogy between Electric and Magnetic Circuits; Magnetic Leakage and Fringing; Kirchhoff’s Laws for Magnetic Circuits; Air Gaps in Magnetic Circuits. Self-Inductance, Mutual Inductance, Coupling Coefficient; Dot Convention; Coupled Coils in Series and Parallel.
Unit IV: Alternating Voltage and Currents
Physical Model for a Sinusoid, Phase and Phase Difference, Average Value, Effective Value, Form Factor And Peak Factor, Concept of Phasors, Addition of Phasors Using Complex Numbers, Non-sinusoidal Waveforms, Power and Power Factor; Behaviour of $R$, $L$ and $C$ in AC Circuits.

AC Circuits: Series $RL$ Circuit, Complex Impedance; Series $RC$ Circuit, Complex Power; Parallel $RL$ Circuit; Parallel $RC$ Circuit; Series $RLC$ Circuit and its Phasor Diagram; Parallel $RLC$ Circuit and its Phasor Diagram.

Unit V: Network Theorems for AC Circuits
Superposition Theorem, Thevenin’s Theorem, Norton’s Theorem, Maximum Power Transfer Theorem.

Three Phase Circuits and Systems: Advantages of Three-Phase System; Generation of Three-Phase Voltages; Three-Phase Loads, Star and Delta Connected Three-Phase Systems; Power in Three-Phase Systems.

Unit VI: Advanced Circuit Analysis
Introduction, Definition to Laplace Transform, Properties of Laplace Transform, Applications to Circuits, Introduction Trigonometric and exponential Fourier Series, Symmetry Consideration, Circuit application

Text Books:

Reference Books:
Course Description

Title of Course: Introduction to Computer and Programming  
Course Code: 14B11CI111
L-T-P Scheme: 3-1-0  
Credit: 4

Objective:
This class is designed to explore computing and to introduce you to the art of computer programming. You will develop a sense of style and aesthetics for programs that will help your programming. You will be introduced to the design principles for writing good programs. This course teaches not only the mechanics of programming, but also how to create programs that are easy to read, maintain, and debug.

Learning Outcomes:
1. Knowledge of structured programming in program design
2. Writing programs in C, Pascal
3. Program documentation skills
4. Program testing skills

Course Content:
Introduction to Programs, Processing programs, Types of Programming Languages, Programming Design tools (Pseudo code and Flowcharts), Program Design, Structured Programming, Problem solving and programming, Quality aspects of structured programs, Testing and Debugging Techniques, Self Learning of Pascal.

Teaching Methodology:
The course will cover the use of C language. Students will learn Pascal programming on their own. The expectation is that students will become self-sufficient in learning any programming language on their own thereafter. Students will write the same programs in Pascal as given in the C laboratory.

Text Book:

Reference Books:
5. “Programming in PASCAL”, Schuam’s Series.
Course Description

Title of Course: Physics Lab-I  
Course Code: 14B17PH171  
L-T-P Scheme: 0-0-2  
Credit: 1

Course Content:

List of Experiments

1. To study the variation of magnetic field along the axis of Helmholtz Galvanometer and to determine its reduction factor.
2. To determine the specific rotation of cane sugar solution using Biquartz polarimeter.
3. To observe Newton’s rings and to determine the wavelength of sodium light.
4. To determine the wavelengths of spectral lines Red, Green and Violet of mercury using plane transmission grating.
5. To study the presence of energy levels in an atom by Franck-Hertz Experiments.
6. To determine the resistance per unit length of a Carey Foster’s bridge and to obtain the specific resistance of a given wire.
7. To determine the Planck’s constant using solar cell.
8. To determine the wavelength of sodium light with the help of Fresnel’s biprism.
9. To draw hysteresis loop of a ferromagnetic material and to calculate its retentivity and coercivity.
10. To study ultrasonic waves in aluminum and to obtain Young’s modulus for it.

Course Description

Title of Course: Electrical Circuit Lab  
Course Code: 14B17EC171  
L-T-P Scheme: 0-0-2  
Credit: 1

Course Content:

List of Experiments

1. To familiarization with the Digital multimeter (DMM) and measurement of various signals and circuit elements.
2. To familiarization with the CRO, Function generator and power supply.
3. a) To study & draw the volt-ampere characteristics of the resistor.
   b) To study the loading effect of a voltmeter
4. To verify Thevenin’s Theorem.
5. To verify Tellegen’s Theorem.
6. To verify Superposition Theorem.
7. To verify Reciprocity Theorem.
8. To verify Maximum Power Transfer Theorem.
9. To determine the Z parameters of the given two port network.
10. To determine the Y parameters of the given two port network.
11. To sketch the transient response of RC Low pass filter.
12. To sketch the transient response of RC High pass filter.

Text Books:


**Reference Books:**
Course Description

Title of Course: Computer Programming Lab
Course Code: 14B17CI171
L-T-P Scheme: 0-0-4
Credit: 2

Objective:
This course is designed to familiarize students with the basic components of a computer, so as to be able to operate it and be able to interact with it, and carry out simple tasks.
Also, it will initiate the students into the discipline of Programming. It aims to start off the development of problem solving ability using computer programming. This course teaches not only the mechanics of programming, but also how to create programs that are easy to read, maintain, and debug. Students are introduced to the design principles for writing good programs.

Learning Outcomes:
They will develop their ability to design, develop, test and document structured programs in C language.

Course content:
1. Initial exercises on MS office.
2. Familiarity with Microsoft word.
3. Familiarity with Microsoft power point.
4. Familiarity with Microsoft excels.
5. Pattern generating problems.
6. Loop Control and Case Control Structures.
7. Arrays and Strings.
8. Functions and Pointers.
9. Structures and Union.
11. File I/O, the C Library

Text Book:

Reference Books:
5. “Programming in PASCAL”, Schuam’s Series
# Semester-II (A2)

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Course Description

Title of Course: Group and Cooperative Process  Course Code: 14B11HS211
L-T-P Scheme: 3-0-0  Credit: 3

Objective:
Enable the students understanding how to work with and through others to accomplish individual and group goals. Methods of instruction will include cases, simulations, lectures and group activities.

Learning Outcomes:
After completing this course the students will have an understanding of individual, interpersonal and group processes that influence behavior within teams and organizations. They will also be able to effectively use the various tools in their daily activities.

Course Content:

Unit I: Introduction to Organizational Behaviour
Ability, Personality, Myers-Briggs Type Indicator (MBTI), Learning, Perception, Values, Terminal Values, Instrumental Values, Importance, Attitude and Job Satisfaction, Assertiveness, Emotional Intelligence.

Unit II: Group
Foundation of group behavior, Models of group development, Group structure, Group Processes, managing change, managing conflict.

Unit III: Teams
Teams vs. Groups, Types of teams, Contemporary issues in managing teams.

Unit IV: Motivation
Basic concepts & theories of motivation, Motivating group members, Implications for engineers.

Unit V: Leadership
Basic concepts & theories of leadership, leading a team, Implications for engineers.

Text Books:
1. Organizational Behavior – Stephen P.Robbins
3. Emotional Intelligence –Daniel Goleman

References Books :
1. The assertiveness – Randy J.Peterson
2. Organizational Behavior – L.M.Prasad
Course Description

Title of Course: Environnemental Studies  
Course code: 14B11GE211
L-T-P Schème : 3-0-0  
Credit : 3

Course Content:

The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, biogeochemical cycles.

Natural resources, their consumption & Protection: Water, Land Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, & Food resources, Role of an individual in conservation of natural resources, Equitable use of resources.


Sustainability & Planned reversal of human destruction to environment: redevelopment of brown fields, energy plantations, social forestry, engineering aspects of Re-use & Recycling, biogas for marginal income groups, organic farming, eco-consumerism, dematerialization, green technologies, eco-tourism. Regulation of technology and innovation, Policy and law: Environmental Laws & Regulations (Different Acts – Environmental Protection Act, Air and Water Acts, Wildlife and Forest Acts), US-EPA, National Environmental Policy; Function of pollution control boards (SPCB and CPCB), their roles and responsibilities, Eco-mark Scheme, Laws relating to Urbana and Rural land use, Ethics

Case studies: Industry – Environment interface
Field Work: Explore the surrounding flora & fauna (Study of common plants, insects, birds document environmental assets), documentation of industries in local region and their possible effects, measure of water, air and land quality, Visit to a local polluted site-Urban/Rural /Industrial / Agricultural, Study of simple ecosystems-pond, river, hill slopes etc

Text books:
2. Textbook of Environmental Studies for UG Courses - Erach Bharucha, University press

References Books:

**Other suggested material:**
1. Issues of the journal: Down to Earth, published by Centre for Science and Environment
2. Audio visuals from: Discovery, National Geographic etc.
Course Description

Title of Course: Mathematics-II
Course Code. : 14B11MA211
L-T-P Scheme: 3-1-0
Credit: 4

Objective:
In this course we have two goals:
1. To learn about a number of different mathematical concepts and methods that is used as tools in mathematical formulations of many computational problems.
2. To gain more experience with mathematical arguments and proof techniques, that provide essential background for reasoning and computation.

Learning Outcomes:
Mathematics-2 has wide applications in every branch of engineering and technology. Students learn many mathematical techniques which are very helpful in analyzing and solving computational problems which occur in engineering.

Course Content:
Unit I: Introduction: Second Order Linear Differential Equations

Unit II: Convergence of Series, Convergence Tests, Solution in Series.

Unit III: Bessel’s and Legendre Functions, Chebyshev Polynomial.

Unit IV: Second Order Partial Differential Equations and Classification, One Dimensional Wave and Diffusion Equation and Their Applications.

Unit V: Laplace and Poisson Equations, Functions of Complex Variable, Analytical Functions and Cauchy-Riemann Equations.

Unit VI: Poles And Singularities, Complex Integration, Taylor’s And Laurent’s Series, Cauchy Residue Theorem, Contour Integration and Their Applications.

Teaching Methodology:
The course will be covered through lectures supported by tutorials. Apart from the discussions on the topics covered in the lectures, assignments and quizzes in the form of questions will also be given for practice.

Text Books:
   a) Mathematics for Engineers
   b) Advanced Mathematics for Engineers,

References Books:
Course Description

Course title: Physics-II  
Course Code: 14B11PH211
L-T-P Scheme: 3-1-0  
Credit: 4

Objective & Learning outcomes:
Broadly, the study of Physics improves one’s ability to think logically about the problems of science and technology and obtain their solutions. The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters. At the end of the course, the students will have sufficient scientific understanding of electromagnetic fields and waves, basic understanding on semiconductor material, their applications to some ideal systems and solids.

Course Content:

Unit I: Electromagnetism: Review of vector calculus, Coulomb’s law, Gauss law and its applications, boundary value problems, Biot-Savart law, Ampere’s law, Faraday’s law of induction, boundary conditions, Electrical and magnetic filed in matter, Maxwell’s equations in free space and dielectric media. Electromagnetic waves in matter, Derivations of expressions for energy density and energy flux (Poynting vector) in an electromagnetic field, Radiation pressure. Propagation of EM waves through boundary- Reflection, Refraction, Absorption and Total Internal Reflection.

Unit II: Band theory of solids, carrier scattering, effective mass, Electronic conduction in metals, Intrinsic and extrinsic (n- and p-type) semiconductors and their electrical conductivity. Direct and indirect band gap semiconductors, optical and thermal properties, Hall Effect in semiconductors.


Unit IV: Device Processing Technology: oxidation, diffusion, ion-implantation, deposition, lithography, etching and interconnect. Integrated-Circuit Technology: understanding at the level of Muller and Kamins of integrated-circuit fabrication processes.

Text Books:
1. D. J. Griffiths, Introduction to electrodynamics, Prentice Hall of India Ltd.

Reference Books:
1. Semiconductor Physics And Devices, Donald A. Neamen
Course Description

Title of Course: Electronic Devices and Circuits       Course Code: 14B11EC211
L-T-P Scheme: 3-1-0                                   Credit: 4

Course Content:
Unit I: Semiconductor Physics

Materials, Intrinsic semiconductors, Covalent bonds, Electron-hole concepts, Random movement of carriers, Hole as a particle, Recombination of electrons and holes, Conductivity of semiconductors. Extrinsic Semiconductors, Donor and acceptor impurities.

Unit II: Semiconductor Diodes

Unidirectional property, $PN$-junction with no bias, with forward bias and with reverse bias, Transition and diffusion capacitances. $V-I$ characteristics, Comparison of Si and Ge diodes, Temperature effects, Diode resistance (static and dynamic), Diode equation, Ideal diode, Circuit model of a diode. Half-wave and full-wave (centre tap and bridge) rectifiers, PIV rating of diode. Performance of half-wave and full-wave rectifiers, Shunt capacitor filter. Zener diode, Analysis of Zener voltage regulator. Tunnel diode, LED, varactor diode, schottkey diode

Unit III: Bipolar Junction Transistor (BJT)

BJT Structure, Working of a transistor, Transistor current equation, Collector reverse saturation current, DC alpha of a transistor. The three configurations, CB and CE input and output characteristics, DC load line.

Unit IV: Metal-Semiconductor Contacts: equilibrium, idealized metal semiconductor junctions, nonrectifying (ohmic) contacts, Schottky diodes, tunneling.

Unit V: Field-Effect Transistor (FET)

Junction Field-Effect Transistor (JFET): Basic construction, Pinch-off voltage, Drain saturation current, Output and transfer characteristics.

Unit VI: MOS Field-Effect Transistor

Threshold voltage, Depletion and Enhancement type MOSFET---Construction, Operation and Characteristics. Derivation of current-voltage characteristics, dependence on device structure, State-of-the-Art MOS Technology: small-geometry effects, mobility degradation due to channel and oxide fields, velocity saturation, hot-electron effects, device wear out mechanisms.

Unit VII: Transistor Biasing

Need of biasing, Choice of operating region, Need for bias stabilization, Fixed bias circuit, Analysis of fixed bias circuit, Saturation point. Emitter-feedback bias circuit, its analysis and drawbacks, Emitter-bias circuit, its analysis, Voltage divider bias circuit, approximate analysis, more accurate analysis. Biasing of FET, Bias stabilization of JFET, Biasing MOSFETs.

Unit VIII: Transistor Amplifiers
Meaning of amplification, Types of electronic amplifiers, Ideal voltage amplifier, Single stage BJT amplifier, Coupling capacitor, Bypass capacitor, Analysis of BJT amplifier. AC equivalent circuit model of BJT, Hybrid parameters, AC analysis using $h$-parameters, Frequency response of an $RC$ coupled amplifier, Effect on bandwidth when stages are cascaded.

Text Books:
2. Electronic Devices and Circuits, Millman, Jacob.

Reference Books:
Course Description

Title of Course: Data Structures
Course Code: 14B11CI211
L-T-P Scheme: 3-1-0
Credit: 4

Objective:
Develop problem solving ability using Programming, develop ability to express solutions to problems clearly and precisely, develop ability to design and analyze algorithms, introduce with fundamental data structures, develop ability to design and evaluate Abstract Data Types and data structures.

Learning Outcomes:
The students shall acquire the generic skills to design and implement data structures and related algorithms for a broad-based set of computing problems.

Course Content:
Data centric approach to software development.
Problem analysis and Data design.
Time and space complexity, Searching.
Sorting, Algorithm visualization, Data types and representation.
Abstract Data Types, Tagged, Array based, Linked, Indexed, and simulated pointer based storage.
Lists, Electronic text, Hypertext, Orthogonal Lists, Sparse matrices List of list.
Buffer. Discrete event simulation.
Tree, Binary Tree, K-ary Tree, Binary Search Tree, Tree traversal.
Graphs and graph traversal. Simple graphics and multimedia data structures.
Kd Tree, Quad Tree, Octree.

Teaching Methodology:
Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples. Tutorials will have conceptual and numerical questions that would aid in strengthening the data structures principles.

Text Books:

Reference Books:
1. Kruse, Tonso, Leung: Data Structures and Program Design in C
2. Langsam, Augestein, Tanenbaum : Data Structures using C and C++
3. Weiss: Data Structures and Algorithm Analysis in C/C++
4. Carrano and Prichard: Data Abstraction and Problem solving with C++
5. Horowitz and Sahni: Fundamental Data Structures
6. Sahni : Data Structures, Algorithms and applications in C++
7. Standish: Data Structures in Java
Course Description

Title of Course: Electronic Devices and Circuits Lab
Course Code: 14B17PH271
L-T- Scheme: 0-0-2
Credit: 1

Objective:
Electronic devices and circuits laboratory is the first year’s laboratory which is the preceding stage laboratory for the Integrated Electronics Laboratory that comes in the further semester of the degree course and it is fully in working condition. This lab is totally based on designing different practical works using basic components prior to the design of digital circuits.

Learning Outcomes:
Keeping in view the student’s background, we have tried to implement simple Transistor and diode based circuits in this laboratory. The entire practical are component based. Currently twelve practical are running using these basic components for EC-102 course of I semester of both ECE and CSE branch. The list of practical is included with this manual. We also have few Experimental kits to demonstrate simple Experimental circuits and we use them whenever is required to demonstrate to the students. A few Experiments are being designed to introduce in our lab based on Linear ICs like Op-Amp & 555 timer ICs. More over we are trying to procure all the types of diodes.

Course Content:
Semiconductor Physics, Semiconductor Diodes, Bipolar Junction Transistor (BJT), Field-Effect Transistor (FET), Transistor Biasing, Transistor Amplifiers, Feedback in Amplifiers, Sinusoidal Oscillators, Operational Amplifiers, Switching Theory and Logic Design.

Text Books:

Reference Books:
3. Electronic Devices and Circuits, Millman, Jacob.
Course Description

Title of Course: Data Structures & Computer Programming Lab  
Course Code: 14B17CI271

L-T-P Scheme: 0-0-4  
Credit: 2

Objective:
Develop problem solving ability using Programming, develop ability to express solutions to problems clearly and precisely, develop ability to design and analyze algorithms, introduce with fundamental data structures, develop ability to design and evaluate Abstract Data Types and data structures.

Learning Outcomes:
Students will be capable to acquire the generic programming skills to design and implement data structures and related algorithms for a broad-based set of computing problems and real life applications.

Course Content:
Searching, Sorting, Data types and representation, Abstract Data Types, Tagged, Array based, Linked, Indexed, and simulated pointer based storage, Lists, Sparse matrices List of list, doubly linked lists, Stack, Recursion removal, Queue, Dequeue, Tree, Binary Tree, K-ary Tree, Binary Search Tree, Tree traversal, Kd Tree, Quad Tree, Octree, Graphs and graph traversal.

Text Books:

References Books:
1. Kruse, Tonso, Leung: Data Structures and Program Design in C
2. Langsam, Augenstein, Tanenbaum : Data Structures using C and C++
3. Weiss: Data Structures and Algorithm Analysis in C/C++
4. Carrano and Prichard: Data Abstraction and Problem solving with C++
5. Horowitz and Sahni: Fundamental Data Structures
# Semester-III (A3)

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Total credits: 25
Course Description

Course Title: Managerial Economics  
Course Code: 14B11HS311  
L-T-P Scheme: 2-1-0  
Credit: 3

Course Content:

Unit I: Introduction to Managerial Economics & Macro-economic Concepts

Unit II: Supply & Demand Analysis

Unit III: Production Theory and Analysis
Production with one variable, optimal employment of a factor of production, Cobb Douglas production function, Three Stages of Production in short – run, Production with two variable inputs, Production Isoquants, Production Isocosts, Optimal employment of two inputs, The expansion path.

Unit IV: Cost Theory and Analysis
Cost concepts – Opportunity, Explicit, Marginal, Incremental and Sunk, Relation between Production & Cost, Short run cost function, Long run cost function, Economies of Scale & Scope, Break Even analysis, Cost Control Techniques.

Unit V: Pricing under Different Market Structures

Text Books:
1. Managerial Economics – Analysis , Problems & Cases by P.L.Mehta , Sultan Chand & Sons
2. Managerial Economics by Craig Peterson , Pearson Education

Reference Books:
1. Managerial Economics: Theory & Practice – Thomas J Webster
2. Managerial Economics by Thomas, Maurice & Sarkar
Course Description

Title of Course: Probability theory and random processes  
Course Code: 14B11MA411
L-T-P Scheme: 3-1-0  
Credit: 4

Objectives: This course has been prepared for ECE and CSE students with the following objectives:
(i) To know about various random life length models and their uses in finding the reliability of different electronic devices.
(ii) To learn about basic properties and characteristics of various random processes with reference to signal and trunk processes.

Learning Outcomes: After learning this course the students will be able to-
(i) Model life random processes using appropriate statistical distributions,
(ii) Compute the reliability of different stochastic systems and
(iii) Apply the knowledge of random processes in signal processing and trunking theory.

Course Contents:
Random experiments & sample space, events. Three basic approaches to probability, conditional probability, total probability theorem, Baye’s theorem, One dimensional random variables(discrete and continuous) and their distributions, bivariate distributions, joint, marginal and conditional distributions characteristic function, covariance and correlation of random variables. Bernoulli, Binomial, Poisson, negative binomial, geometric and probability distributions, Concept of reliability, reliability function, hazard rate function, mean time to failure Introduction and description of random processes, Markov processes, processes with independent increments. Average values of random processes. Stationary processes and computation of their averages. Random walk, Wiener process, Properties of autocorrelation function, ergodic processes Power spectral density function and its properties. Linear systems with random inputs, system in the form of convolution, Gaussian processes, Poison Processes, Markov chains.

Text Books

References
Course Description

Title of Course: Digital Electronics
Course Code: 14B11EC4317
L-T-P Scheme: 3-1-0
Credit: 4

Objective:
The objective of this course is to analyze and design combinational circuits and sequential circuits and to introduce the concept of memories, programmable logic devices and digital ICs.

Learning outcomes:
At the end of the course the student will be able to analyze, design, and evaluate digital circuits, of medium complexity, that are based on SSIs, MSIs, and programmable logic devices.

Course Contents:

Unit I: Conversion of bases, Representation of negative numbers, 9’s and 1’s complement, 10’s and 2’s complement, Binary arithmetic, BCD code, Excess-3 code, Gray Code and Alphanumeric code. Logic gates and Boolean algebra, Standard and canonical representation and minimization of Boolean expressions using Karnaugh Map and Quine – McClusky methods.


Unit IV: Characteristics of logic families, RTL, DTL, TTL, ECL and CMOS logic family, Interfacing between TTL and CMOS and vice-versa, IC 555 timer and its application in multivibrators.

Unit V: Digital to Analog Conversion- Variable resistive type, R-2R Ladder, Weighted converter. Analog to Digital Conversion- Ramp technique, dual slope integrated type, integrating type, successive approximations.

Teaching Methodology:
Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples.

Text Books:

Reference Books:
1. Morris Mano, Digital Logic and Computer Design, PHI
Course Description

Course Title: Signals and Systems    Course Code: 14B11EC311
L-T-P Scheme: 3-1-0    Credit: 4

Course Content:

Unit I: Continuous-time and discrete-time signals, signal energy and power, periodic signals, even-odd signals, exponential and sinusoidal signals, Unit impulse and step functions, continuous and discrete time systems, System classifications.

Unit II: Convolution integral and convolution sum, properties of LTI systems, LTI systems described by differential and difference equation, response of LTI systems.

Unit III: Fourier series representation of continuous and discrete time signals, properties, Fourier Transform representation of continuous-time and discrete time signals, properties, system characterization by linear constant coefficient difference equation.

Unit IV: The Laplace Transform, ROC, properties of Laplace-transform, analysis and characterization of LTI systems using Laplace Transform, Stability and Causality using Laplace Transform.

Unit V: The z-transform, ROC and pole-zero-plot, properties of z-transform, analysis and characterization of LTI systems using z-transform, Stability and Causality criterion.

Unit VI: Introduction to DSP, Random Variable and Random Processes, probability density function, mean, variance, correlation function, power spectral density.

Text Books:

Reference Books:
1. Symon Haykin, Signal & Systems, John Willey and Sons
Course Description

Title of Course: Analogue Electronics  
Course Code: 14B11EC312

L-T-P Scheme: 3-1-0  
Credit: 4

Objective:
Extend knowledge of the theory and applications of transistors and transistor amplifier, operational amplifier, integrated circuits. The concepts and use of feedback and feedback (amplifier) design. To provide sufficient knowledge and experience so that students will be able to make meaningful design choices when asked to design a (simple) amplifier and oscillator to meet or exceed design specifications. Introduce students to the use of a variety of analog electronic components.

Learning Outcomes:
The students shall acquire the generic skills to design and implement of basic electronics circuits and op-amp based circuits.

Course Content:

Unit I: Multistage Amplifiers: AC analysis of BJT and FET amplifiers: Small signal equivalent and large signal models of BJT, JFET and MOSFET. Biasing for discrete circuit design, Common Emitter, Common Base and Common Collector BJT amplifier stages; JFET Common source amplifier; Common Source, Common Gate and Common Drain MOSFET stages.

Unit II: Frequency Response: Small-signal high-frequency hybrid-pi model of a BJT, Amplifier transfer function: low-frequency, mid and high-frequency bands, General expressions for the low frequency and high frequency responses, Miller’s theorem, Short-circuit and Open-circuit time constants methods for the approximate determination of break-frequencies, CE, CC and CB configurations, BJT and FET RC Coupled Amplifiers – Frequency Response, Cascaded Amplifiers, Calculation of bandwidth of single and multistage Amplifiers, Concept of Gain Bandwidth Product, Frequency response of JFET and MOSFET amplifiers, Cascode configurations.


**Unit V: Power Amplifiers:** Classification, Transfer characteristics, power dissipation, power conversion efficiency of Class A and B output stages. Cross-over distortion and its reduction. Class AB output stage: transfer characteristics, biasing circuits. $V_{BE}$ multiplier and its use in biasing Class AB stage. Power BJTs: thermal resistance, power dissipation vs temperature, Use of heat sinks. Short-circuit protection of output stages.

**Feedback in Analog Circuits:** Advantages of negative feedback, Loop gain, feedback factor, Closed-loop gain. Basic feedback topologies: Series- Shunt, Series-Series, Shunt-Shunt and Shunt-Series configurations. Derivation of input resistance, output resistance and closed-loop gain of the above for both the ideal and practical amplifiers. Stability of feedback amplifiers, Gain and Phase-margins. Frequency compensation.


**Text Books:**
2. Bolleystead, Electronic Devices and Circuits –

**Reference Books:**
1. David A. Bell: Electronics Devices & Circuits, PHI
2. J B Gupta: Electronics Devices & Circuits
Course Description

Title of Course: Digital Electronics Lab
Course Code: 14B17EC377
L-T-P Scheme: 0-0-2
Credit: 1

Objective:
Digital Electronics laboratory is the Second year’s laboratory which is totally based on Digital components. This laboratory has been designed for the students of III semester of the degree course of Electronics and Computer branches of our institution and it is fully in working condition.

Learning Outcomes:
With the help of this laboratory, students will learn about the basics of digital electronics that how a data is being converted to digital form and how the data communicates in the digital form and how to interface the Logic gates IC with each other. The base of this subject will be helpful in further laboratory of Microprocessor and Interfacing. The entire practical are running smoothly and we keep on checking each practical kit separately time to time for its working.

Course Content:
Implementation of DTL and TTL circuits, Verification of logic functions of the TTL ICs
Implementation of combinational digital circuits using MSI Logic
K-map and Boolean function simplification for efficient implementation of digital systems
Implementation of Binary Adders and Subtractor
Implementation of code converters (Gray-to-Binary & Binary-to-Gray)
Implementation of magnitude comparators,
Implementation of BCD-to-Seven Segment Decoder/Driver
Use of Flip-Flop TTL IC in digital system, Implement the 4-Bit binary counter using 7493
Verification of various logic functions of the TTL ICs using 7493 binary counter and measurement of propagation delay, Use of Multiplexer TTL IC for designing digital systems
Use of De-multiplexer TTL ICs for designing digital systems
Implementation of shift register, Implementation of Shift register counters
Implementation of Johnson counters with decoding logic

Text Books:
1. Morris Mano, Digital Logic and Computer Design, PHI

Reference Books
1. Zainalabdil Navabi , Analysis & Modeling of Digital System, TMH
Course Description

Course Title: Signals and Systems Lab  
Course Code: 14B17EC371
L-T-P Scheme: 0-0-2  
Credit: 1

Course Content:
List of Experiments
The application software is used: MATLAB 6.5
1: Signal generation
2: Creating user function for generating delta-function, unit-step function, periodic signal
3: Creating user function for performing signal operation: folding, shifting and signal addition.
4: To verify the linearity and time-invariance of the discrete-time systems.
5: Response of discrete-time LTI systems
6: MATLAB implementation of discrete time LTI systems, Auto and Cross Correlation.
.7: MATLAB Implementation of Fourier series and ramp function
.8: Synthesizing continuous time periodic signals using Fourier series.
9: MATLAB implementation of Discrete Time Fourier Transform (DTFT) of signals.
10: MATLAB implementation of Discrete Time Fourier Transform (DTFT) of LTI systems.
Course Description

Title of Course: Analogue Electronics Lab  
Course Code: 14B17EC372

L-T-P scheme: 0-0-2

Credit: 1

Objectives:
Students will be capable to acquire the basic knowledge of circuits which will be implemented with transistors and operation amplifiers. They should also be able to implement some advanced circuits.

Course Content:
Biasing Circuits (Voltage Divider circuit)
Amplifier Circuits
BJT in small signal model
Integrator (Inverting & Non-Inverting)
Differentiator (Inverting & Non-Inverting)
Different type of oscillators

Text Books:
1. David A. Bell: Electronics Devices & Circuits, PHI
2. J B Gupta: Electronics Devices & Circuits

Reference Books:
Course Description

Title of Course: Design and Circuit Simulation Lab  
Course Code: 14B17EC374

L-T-P Scheme: 0-0-2  
Credit: 1

Objective:
This course is going to be introduced first time for the students of 4th Semester, Electronics and Communication. This course is designed in such a way so that the students can learn the fundamental concepts used in any circuit. First few experiments are designed to brush the basic behavior of devices and after these the applications of the basic components in complicated circuits. In this laboratory students can visualize the things which are happening inside the circuit without going to the physical laboratory and can get better feeling of fundamentals. This laboratory is also very useful for projects and design problems. Initially there are 12 experiments lined-up based on analog devices and circuits. It is planned to introduce some digital electronics based experiments in future.

Course Content:
Being a lab course, all the students who are doing this course have to perform the following 12 experiments, Tools: Circuit Maker, Multisim

List of Experiments
1. PN Junction Diode
2. Zener Diode
3. Bipolar Junction Transistor
4. BJT Biasing
5. Junction Field Effect Transistor
6. BJT Frequency Response
7. FET Frequency Response
8. Multistage Amplifier
9. OP-AMP Basic Circuits.
10. OP-AMP base Filters
11. OP-AMP based Oscillators
12. IC Voltage Regulator
Course Description

Title of Course: Unix programming Lab  Course Code: 14B17CI473
L-T-P Scheme: 0-0-4  Credit: 2

Objectives:

- To familiarize students with the architecture of Unix OS.
- To provide necessary skills for developing and debugging programs in UNIX environment.

Learning Outcomes: After completion of the course the student would be able to

- Appreciate the advantages of Unix OS.
- Develop and debug C programs created on UNIX platforms.
- Use and if necessary install standard libraries.

Course Contents:

Unit I: What is Unix/Linux?
Basic overview and history of unix/linux, Command line basics, Commands: ssh, ls, pwd, cd, cp, rm, mv

Unit II: Using the Command Line
Accessing remote servers and files, Editing and manipulating files, Piping commands and saving output, Searching in command line history, Commands: mkdir, nano, cat, head, tail, less, clear, grep, sort, uniq, man, >, |, ssh-keygen

Unit III: Operating System Organization
OS basics, processes, Filesystem layout, File permissions, Commands: chmod, find, locate

Unit IV: Your Own Copy of Linux
Overview of popular Linux distributions, Running Linux in a virtual machine, Super user powers, Installing applications, Commands: make, apt-get

Unit V: Programming in Linux

Simple Bash shell scripting, Compiling C/C++ files, File processing: awk, sed, Commands: gcc, sh

Unit VI: Programming & Scripting- Scripting

Text Books
1. “Unix programming Environment”, B. Kernighan and Rob Pike, PHI.

References
# Semester-IV (A4)

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Course Description

Title of course: Financial Management  
Course code: 14B11HS411
L-T-P scheme: 2-1-0  
Credit: 3

Unit I: Nature of Financial Management and Concepts of Values and Return

Unit II: Investment Decisions

Unit III: Financing and Dividend Decisions

Unit IV: Financial and Profit Analysis

Unit V: Long Term Financing and Working Capital Management

Text Books:
1. Financial Management by I M Pandey
2. Financial Management – Theory and Practice by Prasanna Chandra

Reference Books:
Course Description

Title of course: Electromagnetic Engineering  
Course code: 14B11EC411
L-T-P scheme: 3-1-0  
Credit : 4

Objective:
After completion of course students will be capable to understand the various mode of propagation, all the coordinate systems. In this course basics laws like, Coulomb’s law, Biot-Savart law, Ampere’s Circuital law, Stoke’s theorem and Boundary condition will also be discussed. And then Maxwell’s equations, plane wave reflection and transmission at dielectric interface will also be discussed.

Learning Outcomes:
These concepts then will be used to understand transmission line and waveguide. And finally some basic concepts of antenna and microwave tubes will be discussed.

Course content :
Unit 1 : EM spectrum, Concept of EM wave propagation, Propagation methods, Cartesian coordinate system, Cylindrical coordinate system, Spherical coordinate system.

Unit II: Coulomb’s law, electric field due to a line charge, electric field due to an infinite sheet, Faraday’s experiment of concentric spheres, Gauss’ theorem, Differential volume element, Divergence theorem, Convection current, Equation of continuity, Boundary value problem for electric field, Poisson’s and Laplace equations, Uniqueness theorem.

Unit III: Current distributions, Biot-Savart law, MF due to infinite long current filament, Ampere’s circuital law, MF due to sheet carrying current, Point form of Ampere’s circuital law, Stoke’s theorem, Lorentz force, Force between current element, Magnetic boundary condition.
Faraday’s law, Displacement current, Maxwell’s equation in integral form and differential form.

Unit IV: Uniform plane wave, Propagation in free space, dielectric and conductors; Poynting theorem. Uniform plane wave at normal incidence, Standing wave, Wave reflection from multiple interface, Uniform plane wave at oblique incidence.

Unit V: Transmission line basics, Types of TL, Matching techniques using TL, Smith chart, Transients on TL. Rectangular waveguide, Solution of wave equation in rectangular wave guide, Mode generation, Antenna basics.

Text Books:
1. W.Hayt,” Engineering Electromagnetics’’

Reference Books:
1. J. D. Kraus and R.J.Marhefka,”Antennas for all applications” Tata McGraw-Hill
2. Liao Samuel Y,”Microwave Devices and Circuits”
Course Description

Title of Course: VLSI Circuits
Course Code: 14B11EC412
L-T-P Scheme: 3-1-0
Credit: 4

Course content:

Unit I: Introduction to VHDL

Unit II: Manufacturing process
MOS process flow (Silicon wafer, photolithography, diffusion and ion implantation, deposition, etching, package materials, interconnect levels, thermal consideration in packaging etc), N-well, p-well and twin tub process, VLSI scaling-constant voltage, constant field scaling, limitation of scaling.

Unit III: MOS logic design
MOS fundamentals, I-V characteristics, transfer characteristics, enhancement and depletion MOS, channel length modulation, body effect, biasing of MOSFETs, capacitances in MOS Design of MOS inverter with resistive load, static design of NMOS saturated load inverter, NMOS inverter with linear load, depletion mode load, Design of W/L, power dissipation, propagation delay, and noise margin analysis. CMOS inverter, static and dynamic characteristics of CMOS inverter, CMOS logic gates, Stick diagram, layout, $\lambda$-based design rule

Unit IV: Combinational and sequential circuits
Combinational logic design (Logic gates), MOS Memory-RAM (static and dynamic), ROM, sense amplifier, address decoder, Reliability, Circuit simulation

Unit V: FPGA and ASIC
FPGA basics, Different type of FPGA Architecture, logic design using FPGA, ASIC design, Logic design using ASIC’s.

Text Books:
3. J. Bhasker, VHDL Primer, 3rd edition

Reference Books:
Course Description

Title of Course: Instrumentation and Control
Course Code: 14B11EC416
L-T-P scheme: 3-1-0
Credit: 4

Objective:
The objective of this course is to understand the phenomenon of control system and Instrumentation.

Learning outcomes:
At the end of the course the student will be able to analyze, design, and evaluate control system of medium complexity and also understand internal working mechanism of measuring instruments.

Course Contents:
Unit I: Introduction:
Basic idea of control systems and classification. Linear approximations of systems, Transfer function of linear systems. Block diagrams and Signal flow graph.

Unit II: Time Domain analysis
Performance characteristics in the time domain, Transient response of second order system, Effect of derivative and integral control. Steady state response, Concept of absolute stability, Routh Hurwitz criterion

Unit III: Root Locus method

Unit IV: Frequency Domain analysis and Design
Polar plot, Bode plot, Closed loop frequency response, Stability in the frequency domain, Absolute and Relative stability, Nyquist plot & criterion

Unit V: Cathode Ray Oscilloscope
Block Diagram, Working in detail, Types of CRO, focusing and deflection system, time base circuit, Application of CRO. Bridges – DC & AC Bridges, transformer ratio bridges, self-balancing bridges, impedance measurement by Q-meter.

Unit VI: Transducers
Classification of transducers, Strain gauge, displacement transducer, LVDT, RTD, thermistor, thermocouple, Piezo-electric transducer.

Text Books:

Reference Books:
2. K. Ogata, Modern Control Engineering, PHI
Course Description

Title of Course: Analog Communications
Course Code: 14B11EC414
L-T-P Scheme: 3-1-0
Credit: 4

Course content:

Unit I: Introduction
Review of Signals and Systems, Concept of Bandwidth, Elements of a communication system, Introduction to Modulation, Need for Modulation.

Unit II: Amplitude modulation
Representation and Generation of AM, DSB, SSB and VSB, Detection of AM signals: Coherent detection, Envelope detection.

Unit III: Angle modulation
Concepts of FM and PM, Narrowband and wideband FM, Direct and indirect methods of FM generation, Detection of FM signals

Radio Receivers and Multiplexing Techniques
Super-heterodyne Receiver, Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM)

Unit IV: Phase Locked Loop
Analysis, Circuits & Applications-FM Demodulation, Concept of Synchronization in Communication Systems with PLL

Sampling Theory
Time & Frequency Domain Analysis, Sampling Theorem Samplers, Filtering, Signal Recovery, LP & BP sampling

Unit V: Pulse Modulation Systems
Pulse Modulation analysis: Time Domain & Frequency Domain, Modulation & Demodulation, Time Division Multiplexing

Noise

Text Books:

Reference Books:
Course Description

Title of Course: VLSI Lab 
Course Code: 14B17EC471

L-T-P Scheme: 0-0-2
Credit: 1

Objective:
Students will be capable to acquire the generic hardware development skill through various stages of designing. He will also be able to ensure the quality of hardware through various levels of verifications with xilinx and modelsim. After completion of the course student will be able to design any digital circuit in VHDL and he can also verify his design. Student will also be able to calculate all the parameters like power, timings & memory requirement etc. related to his design.

Course Content
Various Style of Modeling in VHDL
Structural Style of Modeling
Behavioral Style of Modeling
Data Flow Style of Modeling
Designing of Basic Digital Circuits
Basic Logic Gates
Half adder and full adder circuit
Encoder and Decoder circuits
Multiplexers and De-multiplexers circuits
Various Flip-Flop circuits
All types of Registers

Text Books:
1. J Bhasker, VHDL Primer, 3rd edition

Reference Books:
Course Description

Title of Course: Electronics Workshop Lab
Course Code: 14B17EC472

L-T-P Scheme: 0-0-4
Credit: 2

Objective:
Students will be able to understand the identification of different electronic components, use of bread board for testing the circuit, development of Layout from software, Etching, drilling and soldering process along with fault diagnosis.

Course content
1. Physical identification of different Electronic Components like Diode, transistors, FET’s etc
2. Different type of Power supply
3. OP-AMP based Circuits
4. Logic gate based Circuits
5. Combinational & sequential Circuits

List of Projects
1. A-stable multivibrator (IC type)
2. Differential Amplifier
3. Regulated power supply (+/-12V -> +/-5V Power unit)
4. Simple amplifier
5. High pass/ low pass Butterworth filter
6. Digital Logic design (Multiplexer, Encoder etc.)
7. Binary weighted register 4 bit D/A Converter
8. Stair-case Signal Generator
9. Water Level Indicator
10. Electronic Heart
11. Note-Pad Lamp for telephone
12. Panic Alarm
13. Traffic Light Controller
14. Single-Supply Sinusoidal Flasher
15. Fastest Finger First

Text Books:
1. Electronic project book, BPS publication.
2. Electronics for you (Monthly Magazine).
Course Description

Title of Course: Instrumentation and Measurement Lab Course

Code: 14B17EC476

L-T-P Scheme: 0-0-2 Credit: 1

Objective:
Student will be proficient to gain the knowledge of generation & measurement technique, ADC & DAC conversion using different method.

Learning Outcomes:
On achievement of course they will also have knowledge that how to measure of non electrical quantity.

Course Content:
List of Experiments
1. Measurement of pressure using pressure cell
2. Measurement of displacement using LVDT
3. Measurement of temperature using RTD
4. Measurement of unknown inductance using Maxwell’s bridge
5. Measurement of unknown inductance using Hay’s bridge
6. Measurement of unknown capacitance using shearing bridge
7. To generate ramp signal using Miller sweep generator
8. To generate ramp signal using Bootstrap sweep generator
9. To generate staircase signal using staircase generator
10. To study 4-bit digital to analog converter based on R-2R Ladder network
11. To study 8-bit analog to digital converter based on Successive approximation method

Text Books:
1. Sawhney A.K., Sawhney Puneet Electrical and Electronic Measurements and Measuring Instruments
2. Textbook of Electrical Technology: AC and DC Machines Vol. 2 / Theraja, B.L.
3. Electrical Machines / Ghosh, Smarajit

Reference Books:
1. Electrical Machines / Mittle, V. N.
2. Theory and Problems of Electric Machines / Kothari, D. P.
3. Instrumentation, Measurement and Analysis / Nakra, B.C.
Course Description

Title of Course: Analogue Communication Lab  
Course Code: 14B17EC474
L-T-P Scheme: 0-0-2  
Credit: 1

Course Content:

List of Experiments
1. DSB Amplitude Modulation & Demodulation
2. DSB-SC amplitude modulation and Demodulation
3. Generate FM modulated signal using VCO IC and measure modulation index
4. Phase modulation using FM
5. FM modulation and Demodulation
6. Determination of Lock & Capture range of NE 565 PLL IC
7. Pulse width modulation & Demodulation
8. Pulse position modulation & Demodulation
9. TDM pulse amplitude modulation and demodulation
10. Signal sampling and Reconstruction

Text Books:
2. Communication Systems , S Haykins, John Wiley and Sons

Reference Books:
Course Description

Title of Course: Multimedia Lab
Course Code: 14B17CI474
L-T-P Scheme: 0-0-2
Credit: 1

Objectives: To develop an ability to design and implement the multimedia processes using multimedia database.

Learning Outcomes: Students will be capable to acquire the generic programming skills to design and implement the multimedia based real life applications.

Course Contents:
Unit-I: Adobe Photoshop based exercise.
Unit-II: Adobe Illustrator based exercise.
Unit-III: Developing Movie in Windows Live Movie maker.
Unit-IV: Design, Development and Hosting of Website using Microsoft Frontpage.
Unit-V: Macromedia Flash based exercise.
Unit-VI: Project

Text Book

Reference Books
1. Multimedia Fundamentals : Media Coding and Content Processing Vol. 1 / Steinmetz, Ralf
2. Multimedia Systems / with 172 Figures
4. Multimedia An Introduction / Vilamail-Casanova, John
5. Fundamentals of Multimedia / Drew, Mark S.
## Semester-V (A5)

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Course Description

Title of Course: Social and Legal issues
Course Code: 14B14HS541
L-T-P Scheme: 3-0-0
Credits: 3

Course Contents:


Unit IV: ICE Bill: Overview and brief description, Right to Information Act: Overview and brief description

Unit V: Environment Protection Act: Overview and brief description, Corporate Governance: Overview and brief description

Text Books:

Reference Books:
1. Indian contract act, 1872, Pollock & Mulla, revised & edited by Nilima Bhadbhade,
Course Description
Title of Course: Human Psychology  
Course Code: 14B14HS542
L-T-P Scheme: 3-0-0  
Credits: 3

Course Contents:
Unit I: Understanding human experience and behavior: Definition, schools, methods, branches and application of psychology for engineers.
Unit II: Measuring human abilities: Intelligence, Personnel testing; the individual working life:
Unit III: Personality - definition, approaches and theories; Psychological problems of everyday life:
Unit IV: Stress and coping; Psychological disorders, human error & Reliability, Work and mental health.
Unit V: Human learning Theories; conflict resolutions; Leadership and management.

Texts Books:

Reference Books:
Course Description

Title of Course: Professional Ethics
Course Code: 14B14HS543
L-T-P Scheme: 3-0-0
Credits: 3

Course Contents:

Unit I: Values of Liberal Society
Introduction, The nature and characteristics of professions, Obligations and professional services, Obligation to clients, professions and third parties.

Unit II: Introduction to Professional Ethics
The foundations and norms of professional ethics. The need for separate code of conduct for professionals. The relation between professional and general ethics. Moral conflict and the issue of autonomy of professional ethics. Certain specific issues pertaining to medical ethics, legal ethics, computer ethics and business ethics.

Unit III: Indian Value System and Values
Teaching from scriptures and tradition (Geeta, Ramayana, Mahabharata, Upanishads, Vedas, Bible and Quran).

Unit IV: Ethics impact in Business
Ethical Issues in Capitalism and market systems, Ethics and social responsibility, Ethics and marketing, Ethics in finance, Ethics and human resource, Ethics and Information Technology, Intellectual property rights like designs, patents, trademarks, copy rights.

Texts Books:
2. Business Ethics by Laura P Hartman and Abha Chatterjee, Tata McGraw Hill

Reference Books:
Course Description

Title of Course: Macro Economics
Course Code: 14B14HS544
L-T-P Scheme: 3-0-0
Credits: 3

Course Contents:

Unit I: Introduction to Macro Economics

Unit II: Consumption
Theories of Consumption spending: Absolute, Relative, Permanent Income and Lifecycle hypotheses. Consumption under uncertainty, Price Level at the macro level – WPI and CPI.

Unit III: Investment
Theories of Investment spending: Keynesian, Accelerator and Neo-classical, Determination of Money Supply: Functions and Post-war controversy on definition of Money.

Unit IV: Product Market and Money Market
Theories of Demand for Money: Quantity Theory and Keynes approach. Baumol and Tobin Contributions and Friedman’s restatement of quantity theory. IS and LM curves: Derivation, their shifts and rotations. Simultaneous equilibrium of product market and money market.

Texts Books:
1. Macroeconomic Analysis by E. Shapiro, Galotia Publications, New Delhi.

Reference Books:
Course Description

Title of Course: Digital Communication
Course Code: 14B11EC511
L-T-P Scheme: 3-1-0
Credits: 4

Prerequisite:
Students must have detailed study of various communication systems.

Objective:
Develop problem solving ability using Communication Systems, develop ability to express solutions to problems clearly and precisely, develop ability to design and analyze probability of errors, introduce with fundamental of Digital communication.

Learning Outcomes: The students shall acquire the generic skills to study & design various applications of the systems and solve the problems.

Course Content:
Unit I: Introduction
Merits and demerits of digital signals. Review of sampling theorem in frequency domain and time domain.

Unit II: Waveform coding techniques
PCM generation and detection, quantization, quantization error, non uniform quantization, companding, differential PCM, Delta modulation, Adaptive delta modulation.

Unit III: Digital modulation techniques
Line codes. Binary & M-ary modulation techniques: FSK, PSK, DPSK, M-ary PSK, Minimum Phase Shift Keying (MSK) and Quadrature Amplitude Modulation.

Unit IV: Performance analysis of Digital systems

Unit V: Digital systems and error control
Digital radio, Introduction to error control up to hamming codes. Digital Multiplexing standards (for telephony).

Unit VI: Signal Space Analysis

Teaching Methodology:
Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples. Tutorials will have conceptual and numerical questions that would aid in strengthening the data structures principles.
Text Books:
2. Communication Systems, S Haykins, John Wiley and Sons

Reference Books:
Course Description

Course Title: Digital Signal Processing
L-T-P Scheme: 3-1-0
Course Code: 14B11EC512
Credit: 4

Course Content:

Unit I: Discrete Signals
Review of Discrete time sequences and systems, Linearity, shift- invariance, causality and stability criterion.


Unit II: Discrete Fourier Transforms and FFT

Unit III: IIR and FIR Filter Design

Unit IV: Some DSP Applications
Applications in speech processing and power spectrum estimation. Introduction to illustrate applications of DSP in image processing.

Unit V: Adaptive and Multi-rate Systems
Introduction to Adaptive Filters, Design of Adaptive Filters using various techniques, Decimation & Interpolation, Filter design for Sampling Rate Conversation by a Rational Factor I/D.

Text Books:

Reference Books:
2. Andreas Antoniou, Digital Signal Processing : Signals, Systems and Filters, TMH
3. Texas Instruments, Digital Signal Processing Applications with the TMS 320 Family, Prentice Hall
Course Description

Title of Course: Microprocessor and Interfacing
Course Code: 14B11EC513
L-T-P Scheme: 3-1-0
Credit: 4

Prerequisite:
Students must have adequate basics of binary number system.

Objective:
General-purpose microprocessors in personal computers are used for computation, object control, text editing, multimedia display, and communication over the Internet

Learning Outcomes:
They can build a project based on the concepts of interfacing between processing machine and real life application devices.

Course contents:

Unit I: Introduction of microprocessor: Evolution of microprocessor, word length, hardware, software and firmware, input out device, single chip microcomputers, embedded microprocessor, semiconductor memory, RAM, ROM, EPROM, magnetic memory, cache memory, Program and data memory, memory hierarchy, real and virtual memory, processing speed of processor.

Unit II: Microprocessor architecture (Intel 8085): ALU, timing and control unit, registers, data and address bus, pin configuration, Intel 8085 instructions, op-code and operands, instruction word size, Instruction cycle, fetch and execute operation, machine cycle and state, instruction and data flow, timing diagram.

Unit III: Programming of Microprocessor: Machine, assembly and high level language, Instruction and data format, Addressing modes, status flags, Stacks, Subroutines, Assembly language programs.

Unit IV: Peripheral devices and their Interfacing: Address space partitioning, memory mapped and I/O mapped I/O schemes, Data transfer schemes, I/O ports, Programmable Peripheral interface (8255), Programmable Counter/Interval Timer (8253), Programmable DMA controller (8257, 8237A), Programmable Interrupt controller (8259), Programmable Communication Interface (8251), Special purpose Interfacing devices, programmable CRT controller(8275), programmable keyboard controller(8279).

Unit V: Microprocessor-Based data acquisition system and applications: Analog to digital converter (ADC- 0800, 0808/0809) , Digital to analog converter (DAC-0800), Delay subroutine, 7-segment display, Display of alphanumeric characters, microprocessor based speed control of Stepper motor, microprocessor based Traffic light control.

Text Books:

Reference Books:
Course Description

Course Title: Power Electronics
Course Code: 14B11EC514
L-T-P Scheme: 3-1-0
Credit: 4

Objective:
Familiarization with power electronic components.
To understand switching characteristics and requirement of basic solid state power devices.
To analyze and design a broad range of power electronic converters and others systems.

Learning Outcomes:
At the end of the course, the students are expected to
1. Understand basic concept of design of power converters, UPS, speed control of motors.
2. Understand the applications of power electronics in lighting, automobile and space systems.

Course Outline:
Unit I: Power Semiconductor Devices: Diodes- performance parameter, Effects of forward and reverse recovery time, series and parallel connections, transistors- steady state and switching characteristics, Performance parameters, Base/Gate drive control, Series and Parallel operation, di/dt and dv/dt limitation. UJT- operation, characteristics, relaxation oscillators and UJT timing circuits.
Unit II: Thyristors : V-I characteristics, switching characteristics, Gate characteristics, Two transistor model, turn-on, turn-off, di/dt & dv/dt protection, design of Snubber circuit, series and parallel operation, firing- resistance and resistance capacitance firing, commutation techniques- class A, B, C&D.
Unit V: Inverters : Single phase, 120° VSI & 180° VSI, Cyclo converters, Speed control of AC & DC motors using power drive circuits.

Text Books:
1. P. S. Bimbhra, Power Electronics, 3/e, Khanna Publishers

References Books
1. P. C. Sen, Power Electronics, 24th reprint TMH, 2005
Course Description

Title of Course: Detection and Estimation  
Course Code: 14B14EC541
L-T-P Scheme: 3-0-0  
Credit: 3

Prerequisite
Introduction to basic probability theory.

Objective:
To learn how different type of signals can be estimated and detected.

Learning Outcomes:
This subject provides a basic foundation for wireless communication system along with deep understanding of automatic control, radar/sonar, speech and image processing and medical signal processing. Students should able to make inferences from observations about a signal estimation and its detection.

Course Content:
Unit I: Background: Review of Gaussian variables and processes; problem formulation and objective of signal detection and signal parameter estimation in discrete-time domain.

Unit II: Statistical Decision Theory: Bayesian, minimax, and Neyman-Pearson decision rules, likelihood ratio, receiver operating characteristics, composite hypothesis testing, locally optimum tests, detector comparison techniques, asymptotic relative efficiency.

Unit III: Detection of Deterministic Signals: Matched filter detector and its performance; generalized matched filter; detection of sinusoid with unknown amplitude, phase, frequency and arrival time, linear model.

Unit IV: Detection of Random Signals: Estimator-correlator, linear model, general Gaussian detection, detection of Gaussian random signal with unknown parameters, weak signal detection.

Unit V: Nonparametric Detection: Detection in the absence of complete statistical description of observations, sign detector, Wilcoxon detector, detectors based on quantized observations, robustness of detectors.

Unit VI: Estimation of Signal Parameters: Minimum variance unbiased estimation, Fisher information matrix, Cramer-Rao bound, sufficient statistics, minimum statistics, complete statistics; linear models; best linear unbiased estimation; maximum likelihood estimation, invariance principle; estimation efficiency; Bayesian estimation: philosophy, nuisance parameters, risk functions, minimum mean square error estimation, maximum a posteriori estimation.

Unit VII: Signal Estimation in Discrete-Time: Linear Bayesian estimation, Weiner filtering, dynamical signal model, discrete Kalman filtering.

Text Books:

Reference Books:
Course Description

Title of Course: Digital Hardware Design  
Course Code: 14B14EC542

L- T-P Scheme: 3-0-0  
Credit: 3

Objective:
The course shall provide the students with advanced knowledge in modern electronic design with the help of a hardware description language.

Learning outcomes:
After successful completion of the course the student shall be able to design advance digital circuit. Also verify, synthesize and implement a design written in VHDL.

Course content:
Unit I: Introduction

Unit II: Register transfer logic (RTL)
Inter register transfer, arithmetic, logic and shifter micro-operations, conditional control, ASM chart, data-path and control logic design.

Unit III: Processor logic design
Processor organization, arithmetic logic unit, design of ALU, overflow, arithmetic shift, design of multi-purpose accumulator.

Unit IV: Asynchronous Sequential Machine
Introduction to asynchronous sequential machine. Analysis of asynchronous circuits, flow table, race condition, primitive flow table, state reduction, state assignment and synthesis of asynchronous circuit. hazards.

Unit V: Arithmetic logic design
Ripple carry adder, carry look-ahead adder, carry select adder, carry save adder, parallel multiplier, sign multiplication, Baugh-Wooley multiplication algorithm, radix-4 Booth multiplication algorithm

Unit VI: RTL simulation
Package declaration for different data types, use of generate statement, VHDL coding of generic logic components for combinational logic circuits (multiplexer, decoder, parallel adder/ subtractor, ALU and multiplier) and sequential logic circuits (registers and accumulator).

Text Books:
1. M. Morris Mano: Digital Design, Prentice Hall of India,
3. Charls Roth: Fundamental of Logic Design
Reference Books:
3. J.Bhaskar, VHDL Primer
Course Description

Title of Course: Instrumentation and Process Control  
Course Code: 1414EC543

L-T-P Scheme: 3-0-0  
Credit: 3

Objective:
To enable students to understand the basic concept of process control applicable in various industries. It will also give in depth knowledge regarding different type of control strategies instrumentation and controller used in processing industries.

Learning Outcomes:
The students must be able to understand control strategies used in process industry and also be able to propose solution for new requirement.

Course Content:
Unit I
Review of sensors and transducers, Measurement, control and transmission of signals of process parameters like flow, pressure, level and temperature. Control System Component.

Unit II
Objectives of Control, Process Characteristics: Process Equation, degrees of freedom, process and control lag, dead time, load disturbance and its effect on processes, analog control, digital control, Self regulating processes, final control elements, valves and actuators, their various characteristics.

Unit III
Basic Control action, two position, multi-position, floating Control modes, Continuous controller modes: Proportional, integral, derivative, composite controller modes-I, P-D, P-I-D, comparisons of these control actions, design of various kinds of analog controllers, Parameters Adjustment, Controller tuning methods.

Unit IV
Modeling of simple systems-gas liquid and thermal systems, Concept of resistance and capacitance, Nozzle-flapper system, Pneumatic relays and amplifiers, Hydraulic systems, realization of various kinds of controllers for hydraulic and pneumatic applications.

Unit V
Cascade control, ratio control, feed-forward control, selective Control, Split range Control, Furnace Control, Steam temperature Control, Distillation column control, Programmable logical controller (PLC), Supervisory control and data acquisition (SCADA).

Text Books:
Reference Books:
2. B.G. Liptak, Hand Book of Process control, Taylor & Francis Ltd
Course Description

Title of Course: Introduction to Operating Systems  
Course Code: 14B14CI549  
L-T-P Scheme: 3-1-0  
Course Credits: 4

Objectives

In this course we will study the basic components of an operating system, their functions, mechanisms, policies and techniques used in their implementation and examples from popular operating systems. The way different modules in the operating system interact and work together to provide the basic services of an operating system.

Learning Outcomes

The students will have a detailed knowledge of the concepts of process and shared memory, aware of a variety of approaches to process management and main-memory management, including interference, deadlock, scheduling, fragmentation, thrashing, learn the basics behind file systems and input output systems and understand the fundamentals of network and distributed operating systems.

Course Contents:


Text Books:

References
1. J. Archer Harris, Operating systems – Schuam’s outlines, Tata Mc Graw Hill.  
   Gary Nutt, Operating Systems – A modern perspective, Pearson Education.
Title of Course: Digital Communication Lab
Course Code: 14B17EC571
L-T-P Schème: 0-0-2
Credit : 1

Course Content:
List of Experiments:
1. Pulse code modulation
2. Delta / sigma Delta modulation.
3. Adaptive Delta modulation.
4. ASK / PSK Modulation & Demodulation
5. FSK modulation & Demodulation.
7. P N- Sequence.
8. Error control coding.
9. Study of framing & marker in TDM
10. Differential pulse code modulation.

Text Books:
2. Communication Systems , S Haykins, John Wiley and Sons

Reference Books:
Course Description

Title of Course: Digital Signal Processing Lab  
Course Code: 14B17EC572
L-T-P scheme: 0-0-2  
Credit: 1

Prerequisite:
Students must have already basic knowledge of MATLAB and concept of signal operations.

Objective:
Develop problem solving ability using MATLAB, develop ability to express solutions to problems clearly and precisely, develop ability to design and analyze the various digital signal processors such as digital filters.

Learning Outcomes:
The students shall acquire the generic skills to understand, design and implement various signal operations such as convolution, circular convolution etc.

Course Content:
1. Generation of various signals using different operations with MATLAB.
2. Implementation of linear convolution with MATLAB
3. Implementation of circular convolution with MATLAB
4. Implementation of linear convolution using overlap add and overlap save methods with MATLAB
5. Implementation of DFT and IDFT with MATLAB
6. Implementation of various windows with MATLAB
7. Implementation of various filters (FIR and IIR) with MATLAB.

Text Books:

Reference Books:
3. Texas Instruments, *Digital Signal Processing Applications with the TMS 320 Family*, Prentice Hall
Course Description

Title of Course: Microprocessor and Interfacing Lab          Course Code: 14B17EC573
L-T-P scheme: 0-0-2                                          Credit: 1

Objectives:
1. Students will be able to develop, implement and debug 8085 assembly language programs that meet the stated specifications.
2. The student will have the opportunity to apply all the previously acquired knowledge he/she will design of a microprocessors/microcontroller based embedded system to solve an electronic/software problem like temperature controller, Traffic light Simulation, Simple Robot or a simple game toy interfaced with PC.

Contents:
Assemble language programming including modular programming, Input/output programming, Stay resident programming, Alarm programming, Keyboard keys locking programming using 8085 Assembler, Simulation of LED display, Analog to Digital converters, Serial communication, parallel communication, Keyboard, and timer programming using Cx51 Keil Software simulator.

Text Books:

Reference Books
Course Description

Title of Course: Power Electronics Lab
Course Code: 14B17EC574
L-T-P scheme: 0-0-2
Credit: 1

Objective:
Students will be able to do the analysis of electronics power devices & circuits. They will also be able to measure the voltage, current, power and impedance of any Power electronics Circuit.

Course content:
1. SCR, Diac, Triac Characteristics
2. UJT Characteristics & Relaxation Oscillator
3. SCR Commutation Technique
4. Inverters
5. Choppers
6. Steeper & Universal motor Controller
## Semester-VI (A6)

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Course Description

Title of Course: Project Management
Course Code: 14B14HS641
L-T-P scheme: 3-0-0
Credit: 3

Course content:

Unit I: Introduction to Project Management: Defining project management, Project life cycle, Project management maturity model, Project selection and criteria of choice, Types of project selection models, The management of risks, Crystal ball introduction, Project portfolio process. Project management and the project manager, Special demands on the project manager. Project as a part of functional organization, pure project organization, matrix organization & mixed organization.

Unit II: Project Planning: Initial project coordination, Sorting out the project, Work breakdown structure, Linear responsibility chart. Estimating project budgets, Improving the process of cost estimation.

Unit III: Project Scheduling: Discussion of scheduling techniques – PERT & CPM. Resource allocation problems, Crashing of project, Resource loading, Resource leveling, Multi project scheduling and resource allocation.

Unit IV: Project Monitoring & Control: Planning-monitoring –controlling cycle, Information needs and reporting process, Earned value analysis, Project management information system, Three types of control processes, Control of change and scope creep, Project auditing, Project audit life cycle.

Unit V: Project Termination: Varieties of project termination, when to terminate a project, The termination process, Final report

Text Books
1. Projects by Prasanna Chandra
2. Project Management by Meridith and Mantel

Reference Books:
1. Total Project Management : Indian Context by P.K.Joy
2. Effective Project Planning & Management by Randolph & Posmer
Course Description

Title of Course: Business Environment Course Code: 14B14HS642
L-T-P scheme: 3-0-0 Credit: 3

Course Content:

Unit I: The concept of Business Environment, significance and nature. Environment Scanning: meaning, nature and scope, the process of environmental scanning, Interaction between internal and external environments, basic philosophies of Capitalism and Socialism with their variants. Concepts of Mixed Economy.

Unit II: Overview of Political, Socio-cultural, Legal, Technological and Global environment. An introduction to MRTP, FEMA, SEBI Act, Consumer Protection Act; The changing dimensions of these laws and their impact on business.

Unit III: Philosophy and strategy of planning in India; Industrial Policy in recent years; Policy with regard to small scale industries; the monetary policy and fiscal policy, Stock Exchange-BSE-NSE. Depository system in India (Options, Futures and Derivatives) RBI-Role and functions, banking structure reforms; Narasimhan Committee Recommendations, Financial Sector reforms.

Unit IV: E-Banking in India-objectives, trends and practical uses-Recent technological developments in Indian Banking (ATM, Debit and Credit Cards, EMI, EFT) Consumerism, Social Responsibility of business enterprises,

Unit V: New Economic Policy, Globalization, EXIM policy, FDI policy, Multinational Corporation (MNCs) and Transnational Corporations (TNCs), Global Competitiveness.

Text Books:
3. Shaikh & Saleem - Business Environment (Pearson, 1 St Edition)

Reference Books:
Course Description

Title of Course: Fundamentals of Financial Markets  
Course Code: 14B14HS643
L-T-P scheme: 3-0-0  
Credit: 3

Course Content:

Unit I: Introduction: The Financial System
Financial institutions as firms & intermediaries, Financial markets, Lenders and borrowers, The financial system and the real economy, Deposit-taking institutions, Non-deposit-taking institutions, Interest rates.

Unit II: Money Market
Money market purpose and structure, Money market segments, Money market participants, Money market instruments - Treasury bills and other government securities, Commercial papers, Certificates of deposit, Repurchase agreements, Money market interest rates and yields.

Unit III. Debt Market:
Debt market instrument characteristics, Bond market: characteristics & yields, Bond valuation - Discounted models, Bond duration and risk, Bond analysis.

Unit IV: Equity Market
Equity instruments - Common shares, Preferred shares, Private equity, Primary equity market, Secondary equity market structure, Equity market transactions, Equity market characteristics, Stock valuation, Processes of consolidation of stock exchanges.

Unit V: Derivatives Market
Hedging against risk, Description of derivatives markets, Forward and futures contracts: Principles, valuation, uses, Swaps, Options: definition, components, determinants, Option pricing models.

Text Books:
1. Foundations of Financial Markets and Institutions by Fabozzi, Modigliani, Jones.
2. Financial Markets & Institutions by Peter Howells, Keith Bain.

Reference Books:
Course Description

Title of Course: Marketing Management
Course Code: 14B14HS644
L-T-P scheme: 3-0-0
Credit: 3

Course Content:

Unit I: Understanding Marketing Management
Defining Marketing for the 21st Century, Developing Marketing Strategies and Plans

Unit II: Capturing Marketing Insights
Gathering Information and Scanning the Environment, Conducting Marketing Research and Forecasting Demand

Unit III: Connecting with Customers

Unit IV: Building Strong Brands
Dealing with Competition, Creating Brand Equity, Crafting the Brand Positioning

Unit V: Shaping the Market Offerings
Setting Product Strategy, Designing and Managing Services, Developing Pricing Strategies and Programs

Text Books:
Course Description

Title of Course: Telecommunication Networks  
Course Code: 14B11EC611  
L-T-P Scheme: 3-1-0  
Credit: 4

Prerequisite:
Students must have Knowledge of computers and programming, analogue Communication and digital communication.

Objective:
The objective of this course is to build basic concepts of Telecommunication and Computer network and to give an introduction to fundamental concepts in the design and implementation of computer networks, their protocols and applications

Learning Outcomes:
The Students will be able to learn-
1. Basic concepts of Computer Network.
2. The working principle & operation of Internet and Intranet.
3. The working principle of operation of LAN, WAN and MAN.
4. Congestion in the network and network management.

Course Content:


Unit II: Physical Layer: Physical Layer Design Issues (Service provided to data link Layer)  

Unit III: Data Link Layer: Data Link Layer Design Issues (Service Provided to N/w Layer), Framing, error control, flow control, Link Management, Error Detection and Error Correction Coding, Data Link Protocols (Elementary and sliding Window), local and metropolitan area networks. The Medium Access sub layer, Static and Dynamic Channel Allocation in LANs and MANs, ALOHA Protocols (Pure and Slotted), Different Protocols of LAN, IEEE Standard 802 for LAN (802.2, 802.4, 802.5).


Text Books:
1. A.S. Tennenbaum, *Computer Networks*, PHI  
3. Forouzen, Behrouz A.Fegan, Sophia Chung *Data Communications and Networking*, TMH
Reference Books:
Course Description

Title of Course: Object Oriented Systems and Programming

Course Code: 14B11C1615
L-T-P Scheme: 3-1-0                      Credit: 4

Objective:
1. To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
2. To strengthen ability to design and represent solutions to problems using UML notations.
3. To introduce object oriented concepts in C++ and Java.

Learning outcomes:
1. Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
2. Analyze and decompose problem specifications from Object Oriented Perspectives and represent the solution using UML notation.
3. Apply an object-oriented approach to developing applications of varying complexities.

Course outline:

Teaching Methodology:
The course will use the mixed technique of interactive lectures, tutorials, guided case studies, literature survey, regular assignments and project work. Teaching in this course is designed to engage the students in active and experiential learning by taking a problem solving and design-oriented approach with special emphasis on real world applications. In the lectures the fundamental theoretical concepts will be introduced and demonstrated through examples and case studies. Discussion in lecture will be done using design problems which will be implemented in laboratory individually in JAVA and C++. A Quiz of 10 marks will be conducted to test the language proficiency.

Text Books:
2. Lafore R., Object oriented programming in C++, Waite Group
4. Java(tm)2: A Beginner's Guide by Herbert Schildt, Herbert Schildt
5. DBMS APPLICATION : Korth

Reference Books:
1. Lippman F. B., C++ Primer, Addison Wesley
2. Prata S., C++ Primer Plus, Waite Group
3. C++ How to programDeitel and Deitel - Pearson Education
4. Parimala N., Object Orientation through C++, Macmillan India Ltd. 1999
5. Pohl I., Object oriented Programming Using C++, Addison wesley
Course Description

Title of Course: Image Processing
Course code: 14B11EC612
L-T-P Scheme: 3-1-0
Credit: 4

Objectives:
The primary objective of the course is to provide students with the skills and knowledge to apply remote sensing to their own research problems.

Learning Outcomes:
At the end of the course, the student is able to:
1. Describe the processes and hardware of image acquisition
2. Apply pre-processing operations in image enhancement
3. Compare various image segmentation and feature extraction operations
4. Identify image processing applications in various fields

Course Content:
Unit I: Introduction and Digital Image Fundamentals
Digital Image Representation, Fundamental Steps in Image Processing, Elements of Digital image processing systems, Sampling and quantization, some basic relationships like neighbors, connectivity, Distance measure between pixels, Imaging Geometry.

Unit II: Image Transforms
Discrete Fourier Transform, Some properties of the two-dimensional Fourier transform, Fast Fourier transform, Inverse FFT.


Unit III: Image Restoration


Unit IV: Image Segmentation
Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

Representation and Description: Representations schemes like chain coding, Polygonal Approximation, Signatures, Boundary Segments, Skeleton of region, Boundary description, Regional descriptors, Morphology.

Unit V: Recognition and Interpretation
Elements of Image Analysis, Pattern and Pattern Classes, Decision-Theoretic Methods, Structural Methods, Interpretation.

Text Books

References
1. Rosefield Kak, “Digital Picture Processing”
Course Description

Title of Course: Antenna and Propagation  
Course Code: 14B11EC613
L-T-P scheme: 3-1-0  
Credit: 4

Prerequisite
Students must have the concept of Electromagnetic field and transmission line.

Objective:
The objective of this course is to introduce the basics of radiating elements and effect of propagation of radio waves in actual environment.

Learning Outcomes:
After the successful completion of this course the student will be familiar with the phenomena of Wave Propagation (Sky waves, Ground Waves & Space Waves), Transmission lines and Antennas (Antennas Parameters for the design of antennas). This course also includes hand on experience on Wave Propagation Trainer, Transmission Line Trainer and Antenna Trainer.

Course Content:

Unit I: Antenna Basics
Introduction, basic Antenna parameters, patterns, beam area, radiation intensity, beam efficiency, diversity and gain, antenna apertures, effective height, bandwidth, radiation, efficiency, antenna temperature and antenna filed zones.

Unit II: Point Sources and Arrays
Introduction, point sources, power patterns, power theorem, radiation intensity, filed patterns, phase patterns. Array of two isotropic point sources, non-isotropic but similar point sources, principles of pattern multiplication, examples of pattern synthesis by pattern multiplication, non-isotropic point sources, broad side array with non unit- polar amplitude distribution, broad side versus end fire array, direction of maxima fire arrays of n isotropic point sources of equal amplitude and spacing.

Unit III: Electric Dipoles and Thin Linear Antennas
Introduction, short electric dipole, fields of a short dipole, radiation resistance of short dipole, radiation resistances of λ/2 Antenna, thin linear antenna, micro strip arrays, low side lobe arrays, long wire antenna, folded dipole antennas.

Unit IV: Loop, Slot, Patch and Horn Antenna
Introduction, small loop, comparison of far fields of small loop and short dipole, loop antenna general case, far field patterns of circular loop, radiation resistance, directivity, slot antenna, Bali net’s principle and complementary antennas, impedance of complementary and slot antennas, patch antennas, horn antennas, rectangular horn antennas.

Unit V: Antenna Types
Helical Antenna, Yagi-Uda array, corner reflectors, parabolic reflectors, log periodic antenna, lens antenna, antenna for special applications – sleeve antenna, turnstile antenna, Omni directional antennas, antennas for satellite antennas for ground penetrating radars, embedded antennas, ultra wide band antennas, plasma antenna.

Unit VI: Radio Wave Propagation
Introduction, Ground wave propagation, free space propagation, ground reflection, surface wave, diffraction.
Troposphere Wave Propagation: Troposcopic scatter, Ionosphere propagation, electrical properties of the ionosphere, effects of earth’s magnetic field.

Teaching Methodology:
Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples.

Text Books:

Reference Books:
**Course Description**

**Title of Course:** Industrial Training

**Course Code:** 14B11EC691

**L-T-P scheme:** 0-0-0

**Credit:** 0

**Prerequisite:** None

**Course Contents:**
It is to familiarize students with way in which the industry is organized, to expose them to various technologies employed in the industry. It is compulsory for every student to undergo a industrial training, a zero credit item, to be evaluated as satisfactory/unsatisfactory for award of degree.
Course Description

Title of Course: Wireless Communication  
Course Code: 14B14EC641  
L-T-P scheme: 3-0-0  
Credit: 3

Objective:
To learn theory behind wireless communication systems. Development of mathematical models and performance analysis of wireless systems. Introduction to key wireless technologies such as TDMA and FDMA (in GSM), CDMA (in IS-95), OFDM (in WCDMA), MIMO (in LTE). Introduction to key wireless standards such as GSM, IS-95, WCDMA, LTE.

Learning Outcomes:
The students must be able to understand theoretical and practical concept of wireless communication.

Course Content:

Unit II: Cellular Communications: Introduction to Cellular Communications, Frequency reuse, Handoff in cellular communication, Trunking Theory: Erlang-B and Erlang-C model.

Unit III: GSM: Introduction to GSM-900, GSM-1800, Type of channel in GSM, Frame Structure in GSM, Continuous Phase modulation, MSK, GMSK, Security in GSM.

Unit IV: CDMA: Introduction to CDMA, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization.


Unit VI: MIMO: Introduction to MIMO, MIMO Channel Capacity, SVD and Eigen modes of the MIMO Channel, MIMO Spatial Multiplexing – BLASTE. MIMO Diversity – Alamouti, OSTBC, MIMO Beam forming – MRT, MIMO - OFDM, IS 95, WCDMA, LTE

Text Books:

Reference Books:
Course Description
Title of Course: Advance Microprocessor and Microcontrollers
Course Code: 14B14EC642
L-T-P scheme: 3-0-0

Objective:
The development in embedded systems is growing very fast. For designing specific embedded system requirement of microprocessor and microcontroller is compulsory. The students must be updated with latest microprocessor and microcontroller.

Learning Outcomes:
Student got knowledge about assembly language programming for microprocessor and microcontroller. This help for developing project in microcontroller based control system.

Course content:
Unit I: Review of 8085 microprocessor, architecture of 8086 microprocessor, signal description, physical memory organization, general bus operation, I/O addressing capability, special processor activities, minimum and maximum mode, timing diagrams, instruction set, assembly language programming, addressing modes, assembler directives, programming examples, stack structure, interrupt service routing and cycle, microprocessors 8088.

Unit II: Semiconductor memory, RAM interfacing, programmable input-output port 8255, programmable interval timer 8253, programmable DMA controller 8257, programmable interrupt controller 8259A, keyboard and display controller 8279, programmable communication interface USART 8251, programmable CRT controller (8275), programmable keyboard controller (8279).

Unit III: 80286 microprocessor, salient features, internal architecture, 80287 math coprocessor, 32 bit microprocessor, 80386 and 80486 ,pentium processor 80586 architecture, MMX, Intel MMX architecture, pro- and pentium –II.

Unit IV: 8051 microcontroller, embedded processor, comparison of microprocessors and microcontrollers, 8051 family, program counter, ROM space, internal RAM, data types, flag bit, PSW register, register banks, stack time delay, I/O port circuits, assembly language programming addressing modes, counter and timers, interrupt, programs using interrupt.

Unit V: LCD and interfacing and applications ADC and DAC interfacing, external ROM, 8255, frequency measurement, multiple interrupts, measurement and control of physical parameter as temperature, stepper motor control.

Unit VI: 8051 family members as 8052 with capture timer, watch dog timer, pulse width modulation, analog comparators, PIC 16C6X/7X, 16 F8XX microcontroller and architecture, industrial applications of microcontroller.

Text Books:
Reference Books:
Objective:
Information Technology is collectively the technology associated with communication, processing and storing of information. Materials are the building blocks for these technologies. Therefore, search for new materials and study of their properties, useful for information technology field, has become an area of current interest to the scientists and technologists. The present course aims at giving the students a basic knowledge necessary for understanding of electric, magnetic and optical properties of materials used in Information Technology.

Learning Outcomes:
The course will make the basic understanding of properties of different Information Technology materials and hence build up a suitable foundation for the understanding of design and working of communication, processing and storage devices fabricated with these materials.

Course outline:

Text Books:

Reference Books:
1. Van Vlack, Elements of Material Science and Engineering, Pearson Education.
2. Srivastava and Srinivasan, Material Science and Engineering,
Course Description

Title of Course: Algorithms Design  
Course Code: 14B14CI850
L-T-P Scheme: 3-0-0  
Credit: 3

Objectives: The need for efficient algorithms arises in nearly every area of computer science. But the type of problem to be solved, the notion of what algorithms are "efficient," and even the model of computation can vary widely from area to area. In this course in algorithms, we will survey many of the techniques that apply broadly in the design of efficient algorithms, and study their application in a wide range of application domains and computational models.

Learning Outcomes:
At the end of the course,
1. The student shall be able to formulate and seek known solutions to an algorithmic problem.
2. The student will gain sufficient background and facility so that he would be able to read current research publications in the area of algorithms.
3. The student will learn a set of tools for design and analysis of new algorithms for new problems

Course Contents:

Unit I: Fundamental Concepts
Model of computation, Features of an algorithm, asymptotic analysis, Amortized Analysis, Proof Techniques.

Unit II: Algorithm Design Techniques

Unit III: Network Flow and Matching

Unit IV: Numerical algorithms

Unit V: Geometric algorithms
Convex hull, closest pair, Intersection of line segments, Polygon triangulation.

Unit VI: NP Completeness
Polynomial time and intractability, Space and time complexity, Problem Reductions, NP-completeness of satisfiability.

Text Books:
2. Goodrich, Tamassia, "Algorithm Design" Willey India.

References Books:
Course Description

Title of Course: Telecommunication Networks Lab       Course Code: 14B17EC671
L-T-P scheme: 0-0-2                                      Credit: 1

Objective:
The objective of this course is to build basic concepts of Telecommunication and Computer network and to give an introduction to fundamental concepts in the design and implementation of computer networks, their protocols, and applications.

Learning Outcomes:
They will understand the working of protocols of data link and network layer by doing the practical in LAN trainer and network simulator. They will acquire the basic skill of punching of network cables.

Course Content:
1. Identification of network hardware.
2. Fabrication of network cables and trouble shooting.
3. To study stop & wait and sliding window protocol using LAN trainer.
4. To study MAC ALOHA protocol using LAN trainer.
5. To study MAC CSMA and MAC CSMA/CD protocol using LAN trainer.
6. To study TOKEN BUS and TOKEN RING using LAN trainer.
7. To study ETHERNET using OP-NET simulator.
8. To study TOKEN RING using OP-NET simulator.
9. To study SWITCHED LAN using OP-NET simulator.
10. To study Static routing using boson netsim network simulator.
11. To study dynamic routing using boson netsim network simulator.

Text Books:
1. Sybex CCNA Cisco Certified Network Associate Study Guide.5th Edition
2. Forouzen, Behrouz A.Fegan, Sophia Chung Data Communications and Networking TMH

Reference Books:
Course Description

Title of Course: Image Processing Lab
Course Code: 14B17EC672
L-T-P Scheme: 0-0-2
Credit: 1

Objective:
To introduce the students to the basic concepts and analytical methods of satellite remote sensing as applied to environmental systems. The primary objective of the course is to provide students with the skills and knowledge to apply remote sensing to their own research problems.

Course Contents:

Text Books:

References Books:
1. Rosefield Kak, “Digital Picture Processing”
Course Description

Title of Course: Object Oriented Systems and Programming Lab
Course Code: 14B17CI676
L-T-P Scheme: 0-0-2 Credit: 1

Objective:
1. To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
2. To strengthen ability to design and represent solutions to problems using UML notations.
3. To introduce object oriented concepts in C++ and Java.

Learning outcomes:
1. Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
2. Analyze and decompose problem specifications from Object Oriented Perspectives and represent the solution using UML notation.
3. Apply an object-oriented approach to developing applications of varying complexities.

Text Books:
2. Lafore R., Object oriented programming in C++, Waite Group
3. Java(tm)2: A Beginner’s Guide by Herbert Schildt, Herbert Schildt
4. DBMS APPLICATION : Korth

Reference Books:
1. Lippman F. B., C++ Primer, Addison Wesley
2. C++ How to program Deitel and Deitel - Pearson Education
3. Pohl I., Object oriented Programming Using C++, Addison wesley
Course Description

Title of Course: Advance Communication Lab
Course Code: 14B17EC673
L-T-P Scheme: 0-0-2
Credit: 1

Objective:
To get the knowledge of different modulation schemes, multiplexing.

Learning outcomes:
The students shall acquire the generic skills to understand various modulation systems and multiplexing etc.

Course Content:
1. DPSK generation and Detection.
2. QPSK generation and Detection.
3. PCM generation and Detection using a CODEC Chip.
4. Measurement of losses in a given optical fiber (Propagation loss, bending loss) and numerical aperture.
5. Analog and Digital (with TDM) communication link using optical fiber.
6. Measurements of frequency, guide wavelength, power, VSWR and attenuation in a microwave test bench
7. Measurements of directivity and gain of antennas: standard dipole (or printed dipole), microstrip patch antenna and yagi antenna (printed).
8. Determination of coupling and isolation characteristics of a stripline (or microstrip) directional coupler.
9. Measurements of resonance characteristics of a microstrip ring resonator and determination of dielectric constant of the substrate.
10. Measurement of power division and isolation characteristics of a microstrip 3 dB power divider

Text Books:
1. Taub and Schilling, Principle of Communication System, TMH
2. Bernard Skalar, Digital Communications, Fundamental and Applications, Pearson Education
# Semester-VII (A7)

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<thead>
<tr>
<th>S. No.</th>
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## List of HSS Elective-2

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## List of Seventh Semester Electives

To be updated from time to time

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Course Description

Title of Course: Entrepreneurial Development  
Course Code: 14B14HS741  
L-T-P Scheme: 3-0-0  
Credit: 3

Course Contents:

Unit I:  
Entrepreneurship-Enterprise: Conceptual issues. Entrepreneurship vs. Management. Roles and functions of entrepreneur in relation to the enterprise and in relation to the economy. Entrepreneurship is an interactive process between the individual and the environment.

Unit II:  
The process of setting up a small business: Preliminary screening and aspects of the detailed study of the feasibility of the business idea and financing/non-financing support agencies to familiarize themselves with the policies/programs and procedures and the available schemes.

Unit III:  
Management roles and functions in a small business. Designing and re-designing business process, location, layout, operations planning and control. The pros and cons of alternative growth options: internal expansion, acquisitions and mergers, integration and diversification. Crisis in business growth.

Unit IV:  
Brief introduction to Single-Entry system of record keeping. Sources of risk/venture capital, fixed capital, working capital and a basic awareness of financial services such as leasing and factoring.

Unit V:  
The contemporary perspectives on Infrastructure Development, Product and Procurement Reservation, Marketing Assistance, Subsidies and other Fiscal and Monetary Incentives. National state level and grass-root level financial and non-financial institutions in support of small business development.

Text Books:
1. Taneja, Gupta, Entrepreneur Development New Venture Creation,; 2nd ed. Galgotia Publishing Company

Reference Books:
Course Description

Title of Course: Managing and Marketing of Technology
Course Code: 14B14HS742
L-T-P Scheme: 3-0-0
Credit: 3

Course Contents:

Unit I: Understanding Marketing Management
Defining Marketing for the 21st Century, Developing Marketing Strategies and Plans

Unit II: Capturing Marketing Insights
Gathering Information and Scanning the Environment, Conducting Marketing Research and Forecasting Demand

Unit III: Connecting with Customers

Unit IV: Building Strong Brands
Dealing with Competition

Unit V: Building Strong Brands
Creating Brand Equity, Crafting the Brand Positioning

Unit VI: Shaping the Market Offerings
Setting Product Strategy, Designing and Managing Services, Developing Pricing Strategies and Programs.

Text books:
Course Description

Title of Course: Entrepreneurship and Small Business  
Course Code: 14B14HS743
L-T-P Scheme: 3-0-0  
Credit: 3

Course Contents:

Unit I:
Entrepreneurship-Enterprise: Conceptual issues. Entrepreneurship vs. Management. Roles and functions of entrepreneur in relation to the enterprise and in relation to the economy. Entrepreneurship is an interactive process between the individual and the environment. Small business as seedbed of Entrepreneurship. Entrepreneur competencies, Entrepreneur motivation, performance and rewards

Unit II:
Opportunity scouting and idea generation: role of creativity and innovation and business research. Sources of business ideas. Entrepreneur opportunities in contemporary business environment, for example opportunities in net-work marketing, franchising, business process outsourcing in the early 21st century. The process of setting up a small business: Preliminary screening and aspects of the detailed study of the feasibility of the business idea and financing/non-financing support agencies to familiarize themselves with the policies/programs and procedures and the available schemes.

Unit III:

Unit IV:

Unit V:
Issues in small business marketing. The concept and application of product life cycle [plc], advertising and publicity, sales and distribution management. The idea of consortium marketing, competitive bidding/tender marketing, negotiating with principal customers. The contemporary perspectives on Infrastructure Development, Product and Procurement Reservation, Marketing Assistance, Subsidies and other Fiscal and Monetary Incentives. National state level and grass-root level financial and non-financial institutions in support of small business development.
Test Books:

Reference Books:
1. Desai, Vasant Dr. (2004) Management of small scale enterprises New Delhi:
Course Description

Title of Course: Brand Management  
Course Code: 14B14HS744  
L-T-P Scheme: 3-0-0  
Credit: 3

Course Contents:

Unit I: Opening Perspectives
Brands & Brand Management

Unit II: Identifying and Establishing Brand Positioning and Values
Customer-Based Brand Equity, Brand Positioning

Unit III: Planning and Implementing Brand Marketing Programs
Choosing Brand Elements to Build Brand Equity, Designing Marketing Programs to Build Brand Equity, Integrating Marketing Communications to Build Brand Equity, Leveraging Secondary Brand Associations to Build Brand Equity

Unit IV: Measuring and Interpreting Brand Performance.
Developing a Brand Equity Measurement and Management System, Measuring Sources of Brand Equity: Capturing Customer Mindset, Measuring Outcomes of Brand Equity: Capturing Market Performance

Unit V: Growing and Sustaining Brand Equity.
Designing and Implementing Branding Strategies, Introducing and Naming New Products and Brand Extensions, Managing Brands over Time, Managing Brands over Geographic Boundaries and Market Segments

Text Book:

Reference Book:
1. Brand Management, The Indian context, YLR Moortho, Vikas Publication
Course Description

Title of Course: Human Resource Management  
Course Code: 14B14HS745 
L-T-P Scheme: 3-0-0  
Credit: 3

Course Contents:

Unit I:  
Human Resource Management: Meaning, Nature and Scope, HRM functions and objectives, evolution of HRM environment

Unit II:  
Human resource development in India: evolution and principles of HRD Vs personnel functions, Role of HR managers.

Unit III:  

Unit IV:  
Human Resource Planning: Definition, purposes, processes and limiting factors; Human resources information system (HRIS): HR Accounting and audit, Job analysis- job description, job specification.

Unit V:  
Training and Development: purpose, methods and issues of training and management development programmes, Performance Appraisal: definition, purpose of appraisal, procedures and techniques including 360 degree performance appraisal.

Unit VI:  
Job evaluation and Compensation administration: nature and objectives of compensation, components of pay structure in India, Wage policy in India Discipline and Grievance Procedures: definition, disciplinary procedure, grievance handling procedures, Industrial relations: nature, importance and approaches to industrial relations.

Text Books:  
1  Human Resource Management – Stephen P. Robbins  
2  Human Resource & Personnel Management- K.Aswathappa

Reference Books:  
2. Human Resource Management- Ivansevich
Course Description

Title of Course: Total Quality Management
Course Code: 14B14HS746
L-T-P Scheme: 3-0-0
Credit: 3

Course Contents:

Unit I: Introduction
Basics of Total Quality, Total Quality Management, TQM - Thinkers and Thoughts, Quality Awards.

Unit II: Features of TQM
Cost of Quality, Team work for Quality, Total Employee Involvement, Customer Satisfaction.

Unit III: Continuous Improvement
Quality Circles, Kaizen, Six Sigma, People CMM, Benchmarking.

Unit IV: Basic Statistical Concepts
Control of Accuracy and Precision, Process Capability, Statistical Process Control, Quality Function Deployment, Quality Management Systems, Design of Experiments (Taguchi Technique), FMEA, Total Productivity Maintenance.

Unit V: Quality Standards & Certifications

Text Books:

Reference Books:
1. Eckes, Six Sigma for Everyone, CBS Publications.
Course Description

Course Title: Project part-I  
Course Code: 14B19EC791

L-T-P Scheme: 0-0-14  
Credit: 4

Course Content:
1. Motivation about Project Topic
2. Usefulness of the work in the context of present application
3. Literature survey in chronological order.
4. Problem Formulation
5. Study / Analysis of different existing methods based on adequate performance parameters.
7. Block Diagram / Algorithm Steps of proposed method.
Course Description

Course Title: Information Theory and Coding Technique  
Course Code: 14B11EC711  
L-T-P Scheme: 3-1-0  
Credit: 4

Course Content:

Unit I: Review of Basic Probability

Unit II: Information Measure:
Discrete entropy, Joint and conditional entropies, Entropy in the continuous case, Maximization of continuous entropy, Entropy of a band limited white Gaussian process.

Data Compression:
Uniquely decipherable and instantaneous codes, Kraft-McMillan inequality, Noiseless coding theorem, Construction of optimal codes.

Unit III: Data Transmission:
Discrete memory less channel, Mutual information and channel capacity, Shannon’s fundamental theorem and its weak converse, Capacity of a band limited AWGN channel, Limits to communication – Shannon limit.

Error Control Coding:
Coding for reliable digital transmission and storage, Types of codes. Modulation and coding, ML decoding, Performance measures.

Unit IV: Linear Block Codes:
Algebra Background, Groups, Fields, Binary field arithmetic, Vector Spaces over GF Generator and parity check matrices, Syndrome and error detection, Standard array and syndrome decoding, Hamming codes.

Cyclic Codes:
Polynomial representation, Systematic encoding, Cyclic encoding, Syndrome decoding.

Unit V: Convolutional Codes:
Generator Sequences, Structural properties, Convolutional encoders, Optimal decoding of Convolutional codes- the Viterbi algorithm.

Turbo Codes:
Introduction, Distance properties, Performance analysis, Design of the turbo codes, Iterative decoding of turbo codes.

Text Books:

Reference Books:
Course Description

Title of Course: Optical Communication  
Course Code: 14B14EC741  
L- T-P Scheme: 3-0-0  
Credit: 3

Objective:
Knowledge of laser.

Learning Outcomes:
The course will make the basic understanding of properties of different Information Technology materials and hence build up a suitable foundation for the understanding of design and working of communication, processing and storage devices fabricated with these materials.

Course Contents:
Unit I: Introduction Optical Fibers and Laser communication: Light propagation in fibers and Graded Index fibers, Numerical Aperture and Attenuation,

Unit II: Single and Multimode fibers and their propagation characteristics, Low loss fibers, Connectors, Splicing and Splice loss.

Unit III: Couplers; Applications of Laser in various fields including Optical Communication using Optical Cables.

Unit IV: Display Devices. Fluorescent Materials.

Text Books:

Reference Books:
1. Van Vlack, Elements of Material Science and Engineering, Pearson Education.
2. Srivastava and Srinivasan, Material Science and Engineering,
Course Description

Title of Course: Embedded Systems  
Course Code: 14B14CI544  
L-T-P Scheme: 3-0-0  
Credit: 3

Objectives:
Develop an understanding of embedded system design life cycle and co-design concept. Analyze and examine the real time and non-real time operating system systems and determine their role in applications design. Deal with the internal architecture and design methodology of a micro-controller based embedded system.

Learning Outcomes:
Students will be able to
1. Understand the scientific principles and concepts behind embedded systems.
2. Understand the "big ideas" in embedded systems.
3. Obtain direct hands-on experience on both hardware and software elements commonly used in embedded system design.
4. Understand basic real-time resource management theory.

Course Contents:

Unit I: Introduction to Embedded Computing

Unit II: Embedded System Architecture

Unit III: Designing Embedded Computing Platform

Unit IV: Design of Embedded Processors
Application Specific Logic Design using Field Programmable Devices and ASICs. Introduction to Hardware Description Languages. Design Examples- Data Compressor and Alarm Clock.

Unit V: Software Development and Tools
Embedded system evolution trends, round-robin, robin with interrupts, function – one scheduling architecture, algorithms, introduction to- assembler - compiler-cross compilers and integrated development environment (IDE). Object oriented interfacing, recursion, debugging strategies, simulators.

Unit VI: Real Time Operating Systems
Task and Task States, tasks and data, semaphores and shared Data Operating system services- message questimer function- events - memory management, interrupt routines in an RTOS environment, basic design using RTOS.
Text Books:

Reference Books:
Course Description

Title of Course: Video Processing  
Course Code: 1414EC742
L- T scheme: 3-0  
Credit: 3

Objective:
This course provides the basic understanding of Video compression, Motion estimation, Communication standards and its application to live video streaming on 3G Systems, video conferencing, efficient storage of video etc.

Learning Outcomes:
The students are expected to learn the basics of Video Processing, Video representation, Transforms analysis, motion estimation theory, Video Compression techniques.

Course Content:

Unit I: Basics of analog and digital video
Color video formation and specification, video raster, frequency domain characterization of video signals, analog TV systems (color multiplexing and de-multiplexing).

Unit II: Frequency domain analysis of video signals, spatial and temporal frequency response of the human visual system; Digital video format and video format conversion.

Unit III: Video Sampling
Basics of the Lattice Theory, Sampling of Video Signals Over Lattices, Filtering Operations in Cameras and Display Devices, Video Sampling Rate Conversion, Conversion of Signals Sampled on Different Lattices.

Unit IV: 2D motion estimation: 3D and 2D motion modeling, and basic motion estimation methods. Advanced techniques (mesh-based, global motion estimation, multi-resolution approach)

Unit V: Basic compression techniques: information bounds for lossless and lossy source coding, binary encoding techniques (LZW, Arithmetic Coding), scalar and vector quantization.


Unit VI: Video compression standards (H.261 and H.263, MPEG1, MPEG2, MPEG4, H.264).

Stereo and multiview video processing. Error control in video communications and video streaming over Internet and wireless networks.

Text Books:

Reference Books:
Course Description

Title of Course: Microstrip Antenna

Course Code: 14B14EC743

Credit: 3

L-T-P scheme: 3-0-0

Objective:
The objective of this course is to introduce to the students the basics of Microstrip patch antenna and various application of Microstrip antenna.

Learning Outcomes:
After the successful completion of this course the student will be familiar with the phenomena of design of Microstrip antenna Transmission lines and Antennas (Microstrip Antennas Parameters for the design of sot antennas).

Course Content:

Unit I: Microstrip Transmission Lines:
Introduction, microstrip capacitance evaluation, characteristic impedance, the microstrip line in free space, effective relative permittivity. Practical microstrip lines- losses, shielding, substrate materials, dispersion, modes of propagation.

Unit II: Microstrip Components (Lumped & Distributed):

Unit III: Microstrip Components:

Unit IV: Microstrip Antenna:

Unit V: Rectangular Microstrip Antennas
Analysis methods of rectangular microstrip antennas- vector potential approach, Dyadic Green’s function technique, radiating aperture method, cavity model, model expansion model, transmission line model and others. Procedure to determine width, length, radiation pattern, bandwidth, beam width, directivity, gain and losses of rectangular microstrip antenna, applications of rectangular microstrip antenna.

Unit VI: Circular Microstrip Antenna

Unit VIII: Microstrip Antenna Feeds
Introduction, coupling to microstrip patches-coplanar coupling, probe coupling, aperture coupling, electromagnetic coupling. Parallel feeds for one and two dimensions, series feed for one dimension, combined feeds.

**Text Books:**
1. Microstrip and Printed Antenna Design – Bancroft, PHI
Course Description

Title of Course: Introduction to CMOS Logic Circuit Design

Course Code: 14B14EC744

L-T-P scheme: 3-0-0 Credits: 3

Course Content:

Unit I: Physics and modeling of MOSFETS and CMOS inverter
MOSFET characteristics, Current voltage characteristics, Modeling, Scaling theory, Small device effects.

Unit II: CMOS Inverter
Basic circuit and DC operation, Switching characteristics, RC modeling, Propagation delay, Rise and fall time, DC design, transient design, Power dissipation, driving large loads.

Unit III: Switching properties of MOSFETs and Static Logic Gates
n-FET pass transistors, Switching time, Layout, p-MOS transmission characteristics, Series connected MOSFETS, Transient modeling, MOSFET switch logic.

Unit IV: Static logic gates
NAND gate: DC and transient characteristics, design, N input NAND. CMOS NOR gate: DC transfer characteristics, transient time, design, Comparison of NOR and NAND, Complex logic gates, EXOR and equivalent gates Adders SR latch CMOS SRAM cell Schmitt trigger Pseudo NMOS logic gates.

Transmission gate logic Circuits: BASIC structure, Electrical analysis, RC modeling, TG based switch logic gates, TG register, D flip flop, n-FET based storage circuits

Unit V: Dynamic logic circuits concepts
Charge leakage and sharing, Dynamic RAM cell, Clock and synchronization, Clocked CMOS.

CMOS dynamic logic families: Dynamic n-MOS gate analysis, n-MOS-n-MOS cascades, Dynamic PMOS logic, n-MOS, p-MOS alternative cascades, DOMINO Logic, Multiple output, DOMINO logic.

Unit VI: CMOS differential logic families
Dual rail logic, Cascade voltage switch logic (CVSL), Variations on CVSL logic, Complementary pass transistor logic, Dual pass transistor logic (DPL)

Interconnect and transmission lines:
On chip interconnects, Modeling, clock distribution, couple capacitor and crosstalk, Transmission lines.

Text Books:

Reference Books:
Course Description

Title of Course: Multi-rate Signal Processing and Filter Banks
Course Code: 14B14EC745
L-T-P scheme: 3-0-0
Credit: 3

Objective:
1. Design efficient digital filters that meet a required frequency response specification and utilize such filters as part of a system to alter the sampling rate of a signal
2. Develop efficient polyphase implementations of sampling rate converters
3. Design multi-channel filter banks to decompose a signal into subbands and then synthesize a full-band signal from the subband components

Learning Outcomes:
To master the fundamentals of multirate signal processing and demonstrate the ability to solve problems in sample rate conversion, filter banks, and transmultiplexers.

Course Content:
Unit I: Review of digital filters
Digital FIR filter design, Filter specifications, ideal filters; Equi-ripple filters; Windowing and the Gibbs phenomenon; The Remez Algorithm, Digital IIR filter design, Bilinear transformation.

Unit II: Fundamentals of Multi-rate Systems
Down sampling, Up sampling, commutativity of up sampling and down sampling, noble identities, inter-connection of building blocks, poly-phase representation of signals and filters, multi-stage implementation, applications of multi-rate systems.

Unit III: Useful classes of filters such as Nyquist Filter and square-root Nyquist filter
Systems using re-sampling filters, Re-sampling filters: Interpolators, Interpolator architecture, band-pass interpolator, rational ratio sampling, arbitrary re-sampling ratio, Farrow filter.

Unit IV: Half-band filters
Half-band low pass and high pass filters, window design of half-band filter, Remez Algorithm design of half-band filters, Hilbert transform band-pass filter, Interpolating with low pass half-band filters. Dyadic half-band filters. Recursive poly-phase filters: All pass recursive filters, two-path and M-path recursive all-pass filters.

Unit V: Cascade and multiple stages filter structures
Communication systems applications: timing recovery in a digital demodulator digitally controlled sampled data delay, FM receiver and demodulator.

Text Books:

Reference Books:
Course Description

Title of Course: Satellite Communication
Course Code: 14B14EC746
L-T scheme: 3-0
Credits: 3

Course Content:

Unit I: Introduction: Brief History, Overview, Satellite Orbits: Orbital mechanics, Look Angle determination, Launch Vehicles: Placing satellite in geostationary orbit, geostationary transfer orbit, Orbital effects in communications, Types of Orbits, Coverage and frequency consideration

Unit II: Satellite Link: Basic transmission theory: EIRP, free-space transmission, System Noise: Noise figure, noise temperature, C/N ratio of earth station. Downlink design, uplink design, combined uplink- down link C/I/N


Unit IV: Error Control Coding Error detection and correction, Channel capacity, Error control coding: Linear and cyclic block codes, Convolution codes, Implementation of error detection on satellite links. Propagation effects and their impact on Satellite -Earth links: Quantifying attenuation and depolarization, Propagation effects that are not associated with Hydrometeors, Rain and Ice effects, Prediction of Rain attenuation, Prediction of XPD.

Unit V: Satellite Navigation and GPS
Radio and Satellite Navigation, GPS Principles, GPS receiver and codes, GPS Navigation message, GPS signal levels, timing accuracy, GPS receiver operation

Text Books:

Reference Books:
Course Description

Title of Course: Neural Network
Course Code: 14B14EC747
L-T-P scheme: 3-0-0
Credits: 3

Prerequisite
Students must have knowledge on “Linear Algebra”.

Objectives
To provide the knowledge of different methodologies used to design a neural network that can handle the raw data and get trained according to the input output mapping. To inculcate ability to design and analyze different algorithms and problem solving ability like error function optimization through enhancing the programming skills.

Learning Outcomes
The students should get the idea about the problems that can be effectively solved by neural network like pattern classification, character recognition, image processing, medical diagnostic etc. and shall acquire the generic skills to design and implement neural structures and related algorithms.

Course Content:
Unit I: Introduction & history, human brain, biological neuron, models of neuron, network architecture. Error correction learning, memory based learning, Hebbian learning, Competitive learning, Neuron signal function, Mathematical preliminaries and Linear transformations for neural network.

Unit II: Neuron Model and Network Architectures, Pattern recognition, convex sets & convex hulls, space of Boolean function. Perceptron and LMS, pattern space & weight space.

Unit III: Perceptron learning algorithm, MSE error surface, steepest descent search. Multilayered architecture, backpropogation learning algorithm.

Unit IV: Bayes theorem, Probilistic interpretation of neuron function, Associative learning, Competitive learning, Grossberg network.


Unit VI: Adaptive resonance Theory, Self organizing feature MAP, Stability concepts in neural network, Hopfield network.

Text Books:

Reference Books
Course Description

Title of Course: Artificial Intelligence and Applications  Course Code: 14B11CI711
L-T-P Scheme: 3-0-0  Course Credits: 3

Objectives:
In this course we will study the basic components of an intelligent system, their functions, mechanisms, policies and techniques used in their implementation and examples.

Learning Outcomes:
The students will have a detailed knowledge of the concepts of artificial intelligence, various applications of AI in different fields, Aware of a variety of approaches to AI techniques.

Course Contents:
Unit I: Introduction to AI and intelligent agents, Problem solving, Problem spaces and blind search techniques, informed search techniques.
Unit II: Constraint satisfaction problems, Knowledge representation and reasoning techniques, Logic programming, Logical agents, Game playing.
Unit III: Planning, Learning, Reasoning under uncertain situations.
Unit IV: Expert systems, Decision support systems, Domain specific AI applications.

Text Books:
2. Luger, George F, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education.

References Books:
1. Nilsson, Nils J, Artificial Intelligence, Morgan Kaufmann
# Semester-VIII (A8)

<table>
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<th>S. No.</th>
<th>Sub Code</th>
<th>Subject</th>
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### List of HSS Elective-2

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<td>Knowledge Management</td>
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<td>14B14HS842</td>
<td>Industrial Psychology</td>
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<td>3</td>
<td>14B14HS843</td>
<td>Supply Chain Management</td>
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<td>4</td>
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### List of Eighth Semester Electives

*To be updated from time to time*

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<td>14B14EC847</td>
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Course Description

**Title of Course:** Knowledge Management
**Course Code:** 14B14HS841

**L-T-P scheme:** 3-0-0

**Credits:** 3

**Course Content:**

**Unit I: Orientation of KM**
What is KM, KM myths, KM life cycle, Implications for KM, Definitions, Cognitions and KM, Data, Information and Knowledge, Types of Knowledge, Expert Knowledge, Human thinking and Learning, Innovation Dynamics and knowledge processes.

**Unit II: Building KM Systems**

**Unit III: KM tools**

**Unit IV: Epistemological Assumptions and Practice**
Epistemological Assumptions and Practice based perspectives on ICTs, Power as a resource, Critical Discourse on Km, Two perspectives on Power/Knowledge Relationship. Study of Intra-Community knowledge processes.

**Unit V: KM communities**
Inward Looking Communities. Business online Communities, Cross Community. Facilitating/Managing Knowledge between Communities, Using Communities for relationship management and marketing, Cluster analysis, Organizational Culture and KM, Strategic roles of Business Functions, Managing Considerations, managing knowledge projects.

**Text Books:**

**Reference books:**
1. Tiwana, The Knowledge Management Tool Kit, Prentice Hall, 2000
Course Description

Title of Course: Industrial Psychology
Course Code: 14B14HS842
L-T-P scheme: 3-0-0
Credits: 3

Course Content:

Unit I: Introduction to Industrial Psychology
Definitions & Scope of Industrial Psychology, Major influences on industrial Psychology-
Scientific management and human relations schools Hawthorne Experiments

Unit II: Individual in Workplace
Motivation : Theories of Motivation: Early and Contemporary views, Three level Work
Motivation Model, Motivating a Diverse Workforce, Stress management: Understanding
Stress and Its Consequences, Causes of Stress, Managing Stress, Leadership: Style and
Theories of Leadership-Trait, Behavioural and Situational Theories

Unit III: Work Environment & Engineering Psychology
Fatigue, Boredom, Accidents and safety, Job Analysis, Job Satisfaction, Recruitment and
Selection – Different types of recruitment and selection tests, Reliability & Validity of
recruitment tests.

Unit IV: Analysis of Interpersonal Relationship
Group Dynamics: Definition, Stages of Group Development, Group Cohesiveness, Formal
and Informal Groups, Group Processes and Decision Making, Dysfunctional Groups,
Organizational culture Concept, Characteristics, Elements of Culture, Implications of
Organization culture, Process of Organizational Culture,

Text Books:
1. Industrial/Organizational Psychology by J.B Miner, McGraw Hill.
2. Industrial Psychology. Its Theoretical & Social Foundations by Blum & Naylor, CBS
Publication.

Reference books:
Course Description

Title of Course: Supply Chain Management
Course Code: 14B14HS843
L-T-P scheme: 3-0-0
Credits: 3

Course Content:

Unit I: Introduction to Supply Chain Management

Unit II: Logistics, Purchase and Vendor Management
Logistics as part of SCM, Logistics costs, different models, logistics sub-system, inbound and outbound logistics, bullwhip effect in logistics, Distribution and warehousing management, Purchasing & Vendor management: Centralized and decentralized purchasing, functions of purchase, department and purchase policies. Use of mathematical model for vendor rating / evaluation, single vendor concept, management of stores, accounting for materials.

Unit III: Inventory Management
Concept, various costs associated with inventory, various EOQ models, buffer stock (trade off between stock out / working capital cost), lead time reduction, re-order point / re-order level fixation, exercises – numerical problem solving, ABC, SDE / VED Analysis, Just-In-Time & Kanban System of Inventory management.

Unit IV: Recent Issues in SCM
Role of Computer / IT in Supply Chain Management, CRM Vs SCM, Benchmarking concept, Features and Implementation, Outsourcing–basic concept, Value Addition in SCM-concept of demand chain management.

Text Books:
1. Logistics and Supply Chain Management by G. Raghuram, Macmillan
2. Material Management by Dr. Gopal Krishnan, Pearson Education.

Reference books:
1. Supply Chain Management by B.S. Sahay, Macmillan
Course Description

Title of Course: Management of Technology  
Course Code: 14B14HS844
L-T-P scheme: 3-0-0  
Credits: 3

Course Content:

Unit I: Introduction
Introduction to Technology Management –Definition – Concept of creativity –Components – Features – Classification of Technology – Concept and Nature of Technology Management-Drivers of MOT- Significance and Scope of MOT- Role of Chief Technology Officer – Responding to Technology challenges.

Unit II: The Role of Technology in the Creation of Wealth
The Role of Technology in the Creation of Wealth: The creation of wealth, Long-wave cycle, Evolution of production technology. Critical Factors in Managing Technology: The creativity factor, Types of innovation, Technology –price relationship, Managing change

Unit III: Technology Life Cycles
Management of Technology: The New Paradigms Essential issues in technology management, Project planning and management, Management paradigm and the technology factor, Technology Life Cycles: S-curve of technological progress, Multiple generation technologies, Diffusion of technology

Unit IV: The Process of Technological Innovation:

Unit V: The Acquisition and Exploitation of Technology

Text Books:

Reference books:
Course Description

Title of Course: Strategic Management  
Course Code: 14B14HS8454
L-T-P scheme: 3-0-0  
Credits: 3

Course Content:
Unit I: Introduction & Strategic Management Concepts

Unit II: Environmental Scanning and Industry Analysis
Environmental Scanning, Industry Analysis, Competitive Intelligence ETOP Study, OCP, SAP Scanning, Corporate Analysis, Resource based approach, Value-Chain Approach, Scanning Functional Resources, Strategic Budget and Audit.

Unit III: Strategy Formulation

Unit IV: Organizing Strategy Implementation

Text books:
1. Lawrence R.Jauch., Glueck William F. - Business Policy and Strategic Management (Frank Brothers)

Reference books:
Course Description

Title of Course: Project Part-II
Course Code: 14B19EC891
L- T-P scheme: 0-0-16
Credits: 8

Course Content:
1. Identify parameters for performance evaluation.
2. Theoretical comparison of proposed and existing method.
3. It is expected that student will formulate a model for simulation of the system or design to validate the theoretical finding.
4. Student must explain the simulation model clearly through block diagram or flowchart.
5. Mention the chosen platform for simulation with reason (if any).
6. Mention the coding styles clearly.
7. Simulation of design module. It is expected that student will simulate their own design and the existing design which they included in the comparison list to validate the theoretical result.
8. Proper comparison of the simulation result to verify performance.
9. Based on the theoretical and simulation results the project findings are to be highlighted.
Course Description

Title of Course: Spread Spectrum Communication
Course Code: 14B14EC841
L-T-P scheme: 3-0-0
Credits: 3

Prerequisite:
Students must have the knowledge of digital communication.

Objective:
Student will be capable to acquire the knowledge of advance communication system Spread spectrum modulation for secure communication, its antijam characteristics & different wireless standards GSM and CDMA Standards (1 G to 4G).

Learning Outcomes:
On achievement of course they will also have knowledge of typical call flows in GSM network & interfacing technique.

Course Content:

Unit I: Spread Spectrum Systems
Direct sequence spread spectrum methods employing BPSK, QPSK and MSK - Frequency Hop spread spectrum methods - Coherent slow frequency Hop technique - Non coherent slow and fast frequency Hop spread spectrum techniques - Hybrid DS/FH spread spectrum - Complex envelope representation of spread spectrum systems. Communication in the presence of pulse noise jamming - Low probability detection scheme - Direct Sequence Spread Spectrum (DSSS) and Frequency Hop Spread Spectrum Systems and examples of Spread Spectrum Systems.

Unit II: Binary Shift Register Sequences for Spread Spectrum Systems
Definition - PN sequence generator fundamentals - Maximal length sequences - Properties, Power spectrum and Polynomial tables for maximal length sequences - Gold codes - Rapid Acquisition systems - Non-linear code generators.

Unit III: Synchronization of Spread Spectrum Systems
Optimal tracking of wideband signals - Early-late tracking loops - Code tracking loops for FHSS-Optimum synchronization techniques - Multiple dwell and sequential detectors - Synchronization using a matched filter - Synchronization by estimating the received spreading code.

Unit IV: Performance of Spread Spectrum System
SS Systems communications models - Performance without coding under AWGN and different jamming environments - spread spectrum systems performances with forward error correction - Block coding - Convolutional coding and specific error correcting codes - Inter leaving - Random coding bounds.
Unit V:

Text Books:

Reference Books:
Course Description

Title of Course: Low Power VLSI
Course Code: 14B14EC842
L-T-P scheme: 3-0-0
Credit: 3

Objective:
Low power VLSI circuit design plays an important role to fulfill the today's hand held device requirement. The circuit designer should know the low power device and circuit techniques so that low-power high performance ICs can be fabricated.

Learning Outcomes:
The students must be able to describe the problem and respective solutions for top to bottom approach of low power IC production. They must be able to show that how low power VLSI techniques can be employed for commercial electronics.

Course Content:

Unit I: Introduction
Need for low power VLSI circuits, Source of power dissipation, power and energy basics, Short Circuit Power Switching Power, Gliching Power, Static Power Dissipation. Emerging Low power approaches.

Unit II: Physics of power dissipation in CMOS FET devices
Low power VLSI design limits: fundamental limits, material limits, device limits, circuit limits, system limits, practical limits.

Unit III: Power estimation
Modeling of signals, signal probability calculation, switching activity in combinational logic, switching activity in sequential logic, estimating average power in combinational and sequential logic.

Unit IV: Low power circuit design techniques
Dynamic power optimization: Device feature size scaling, Supply Voltage Scaling Approach, Dynamic voltage scaling, Multi-Vdd Circuits. Static power optimization: Leakage power consumption in deep sub-micron technologies, Variable-threshold-voltage CMOS (VTCMOS) approach, Multi-threshold-voltage CMOS (MTCMOS) approach, Dual-Vt assignment approach (DTCMOS), Transistor stacking. Ultra low power circuit techniques: Subthreshold logic, Adiabatic logic.

Unit V: Optimizing power at system level design
Architecture, Parallelism, Pipelining, Interconnect and clock, Clock gating. Variation tolerant design, EDA tools for low power, Simulation methods, Low power random access memory circuits. Algorithm and architectural level methodologies: Introduction, design flow, algorithmic level analysis and optimization, Architectural level estimation and synthesis.

Text Books:
5. Jan Rabaey, Low Power Design Essentials, Springer

Reference Books:
Course Description

Title of Course: Data Compression    Course Code: 14B14EC843
L-T-P scheme: 3-0-0    Credit: 3
Prerequisite: Information Theory and Coding and Image Processing

Objective:
This course is highly demanding due to huge application areas like communication, transmission and storage of huge amount of data. Data compression is wide application areas like remote sensing, medical application, broadcasting and many more. This course provides the basic understanding of data compression and its application to Audio, Image and Video compression.

Learning Outcomes:
The students are expected to learn the basics of data compression, data representation, Transforms coding, entropy coding and the application of different data compression algorithms and methods to different areas like Voice and video coding.

Course Content:

Unit I: Introduction
Compression techniques: Lossless and lossy compression, Measurement of performance.

Unit II: Mathematical preliminary for lossless compression: Brief introduction of information theory, Coding, Huffman coding algorithm, minimum variance Huffman Codes, Extended Huffman codes, Adaptive Huffman coding, Golomb Codes, Rice Codes, Tunstall Codes, Application of Huffman coding. Arithmetic Coding


Unit IV: Lossless-image compression: Old JPEG standards, CALIC, JPEG-LS, Multi-resolution Approach, Run length Coding Lossy Coding: Mathematical preliminary, Distortion criteria, Probability model Scalar Quantization: Uniform quantizer and Application to image compression

Unit V: Vector Quantization: The Linde-Buzo-Gray algorithm Transform Coding: Karhunen-Loeve Transform, DCT, DST, DWHT Quantization and coding of transform coefficients, Application to image compression, JPEG, Application to audio compression-the MDCT

Text Books:
2. Raghuveer M. Rao, "Wavelet Transforms: Introduction to Theory and Applications", Addison-Wesley

Reference Books:
Course Description

Title of Course: Wireless and Sensor Network  
Course Code: 14B14EC844

L-T-P scheme: 3-0-0  
Credit: 3

Prerequisite
Students should have the knowledge of detection and estimation.

Objective:
To learn theory behind wireless communication systems. Development of mathematical models and performance analysis of wireless systems. Introduction to key wireless technologies such as TDMA and FDMA (in GSM), CDMA (in IS-95), OFDM (in WCDMA), MIMO (in LTE). Introduction to key wireless standards such as GSM, IS-95, WCDMA, LTE.

Learning Outcomes:
The students must be able to understand theoretical and practical concept of wireless communication.

Course Content:
Unit I: Wireless Communications and Diversity

Unit II: Cellular Communications
Introduction to Cellular Communications, Frequency reuse, Handoff in cellular communication, Trunking Theory: Erlang-B and Erlang-C model.

Unit III: GSM
Introduction to GSM-900, GSM-1800, Type of channel in GSM, Frame Structure in GSM, Continuous Phase modulation, MSK, GMSK, Security in GSM.

Unit IV: CDMA
Introduction to CDMA, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization.

Unit V: OFDM
Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency Offset.

Unit VI: MIMO
Introduction to MIMO, MIMO Channel Capacity, SVD and Eigen modes of the MIMO Channel, MIMO Spatial Multiplexing – BLASTE, MIMO Diversity – Alamouti, OSTBC, MIMO Beam forming – MRT, MIMO - OFDM.

Unit VII: Wireless Standards
IS 95, WCDMA, LTE
Text Books:

Reference Books:
Course Description

Title of Course: Biomedical Signal Processing  
Course Code: 14B14EC845
L-T-P scheme: 3-0-0  
Credit: 3

Prerequisite
Students should have the knowledge of digital signal processing.

Objective:
This course is meant for those engineering students who have some basic exposure to signal processing and want to deepen their knowledge relevant to the biomedical area. Students can use this knowledge to become better prepared to move into the medical-device industry with a thorough understanding of biomedical processes that are currently used for patient care.

Learning Outcomes:
The student should be able to:
1. Describe the origin, properties and suitable models of important biological signals such as ECG, EEG and EMG.
2. Determine and successfully apply suitable algorithms for analysis of biomedical signals.
3. Filtering of signals.

Course Content:

Unit I: Introduction to Biomedical signals: Nature of Biomedical signals. Sources of bio electrical signals: action potential, Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyogram (EMG) and Electroneurogram (ENG). Objectives of biomedical signal analysis. Difficulties encountered in biomedical signal acquisition and analysis. Computer aided diagnosis.


Unit VI: Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Hoffman coding, vector quantisation, DCT and the K L transform.
Text Books:
3. Willis J.Tomkins, “Biomedical Digital Signal Processing”, PHI.

Reference Books:
Course Description

Title of Course: Radar Signal Processing  
Course Code: 14B14EC846
L-T-P scheme: 3-0-0  
Credit: 3

Objective:
Radar Signal Processing provides clear, modern instruction in RADAR DSP basics and the skills needed in both design and analysis of common radar algorithms. This course is ideal for those looking to go beyond the cursory treatment of signal processing in general radar systems to seek more detailed treatments of signal models, waveforms, interference reduction and detection, as well as to gain the foundation needed for specialty that focus on advanced radar signal processing topics such as SAR and STAP.

Learning Outcomes:
At the end of the course, students should have:
- A comprehensive knowledge of the scientific principles of radar systems and related disciplines.
- An awareness of developing technologies.
- A comprehensive knowledge and understanding of mathematical and computer models relevant to radar systems.
- An ability to use fundamental knowledge to investigate new and emerging technologies.
- An ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modeling techniques.

Course Content:

Unit I: Introduction to Radar Systems
The radar range equation: Radar fundamentals, Derivation of range equation, the search radar equation, jamming and radar range with jamming, radar clutter and radar range with clutter. Radar range with combined interferences sources.

Unit II: The Theory of Target Detection
Noise and false alarms, Detection of one sample of signal with noise, integration of pulse trains, detection of fluctuating targets, CFAR, Optimum and matched filter Theory, loss factors in detection.

Unit III: Targets and Interference
Definition of radar cross section, Radar cross section of simple and complex objects, Spatial distribution of cross section, Bi-static cross section.


Unit IV: MTI Radar
Delay lines and line cancellers, sub-clutter Visibility, MTI using range gates and filters, pulse Doppler radar. Non-coherent MTI radar, Pulse Doppler processing, Pulse pair processing, Additional Doppler processing issues, Clutter mapping and the MT detector

Tracking Radar: Different types of tracking techniques, tracking in range, Tracking in Doppler, Comparison of Trackers.

Unit V: Synthetic Aperture Imaging: Introduction to SAR fundamentals, Sitemap SAR data Characteristic, SAR image formation Algorithm.
Unit VI: Introduction to Beam-forming and Space Time Adaptive Processing (STAP):
Spatial filtering, Space time signal modeling, space time signal processing, Computational
issue in STAP.

Text Books:
   2005
2. Mark A. Richards, James A. Scheer, Principles of Modern Radar: Basic principles,
   SciTech Publishing 2010

Reference Books:
2. Fred Nathanson e, Radar Design Principles Signal Processing and the Environment,
Course Description

Title of Course: Speech Processing  Course Code: 14B14EC847
L-T-P scheme: 3-0-0  Credit: 3

Objective:
The main objectives of digital speech coding are to lower the bit rate used to represent a speech signal while maintaining an adequate level of perceptual fidelity. In addition, for some applications we need to consider the complexity (computation required to encode/decode). The most important uses of speech coding are for transmission (e.g. telephone line or cell network) and for storage (e.g. MP3).

Learning Outcomes:
After successful completion of this course, students will be able to
1. Describe and analyze the basic principle of speech production mechanism and redundancies, performance on the basis of measured parameters.
2. Develop the application coding systems.
3. Apply the knowledge and understanding of the concepts in the speech coding methods to solve the engineering problems.

Course Contents:

Unit II: Module 2. Review of Filter design. Linear phase FIR filters, Methods of FIR filter design. Methods of IIR filter design, Applications of FIR & IIR filters in speech. Speech signal processing-the phasor mode,

Module 3. Data and voice coding and waveform coders: PCM, DM, APCM, DPCM, ADPCM


**Text Books:**
1. Digital Signal Processing - by Proakis & Manolakis
2. Digital speech coding for low bit rate communication system by Kondaz A.M, John Wiley & sons, 2nd Edition
4. Principles of Speech Coding By Tokunbo Ogunfunmi; Madihally Narasimha Published: April 29, 2010 by CRC Press Content: 381 Pages | 186 Illustrations

**References Books:**
2. Speech and Audio Processing for multimedia PC’s - by Iain Murray
3. Digital processing of speech signals. L.R Rabinar and R W Schafer, 1978, PHI.
4. A Practical Handbook of Speech Coders Randy Goldberg, Lance Riek CRC Press, 12-Dec-2010 -- 256 pages
5. Voice and Audio Compression for Wireless Communications By Lajos L. Hanzo, Clare Somerville, Jason Woodard, Publisher : John Wiley & Sons, 05-Jun-2008 - 880 pages
Course Description

Title of Course: RF and Microwave Engineering  
Course Code: 14B14EC848
L-T-P scheme: 3-0-0  
Credit: 3

Prerequisite
Specifically students should be familiar with analysis and design techniques of basic electric circuits as well as low frequency electronic devices (particularly diodes and transistors) and related circuits. Understanding phasors and their application in AC circuits, Basic circuit elements with series and parallel configurations, circuit theorems, and average power, effective and complex power, analyzing and solving linear circuits is the main prerequisite for taking this course.

Objective:
Microwave Engineering introduces the student to RF/microwave analysis methods and design techniques. Scattering parameters are defined and used to characterize devices and system behaviour. Passive and active devices commonly utilized in microwave subsystems are analyzed and studied. Design procedures are presented along with methods to evaluate device performance. The free space communication link is examined and equations developed to determine the link carrier-to-noise ratio performance factor. Microwave computer-aided design (CAD) methods are introduced by means of laboratory exercises. Project work serves to develop student engineering design and report writing skills.

Learning Outcomes:
Solve RF/Microwave circuit problems using time-varying sources. Design Microwave amplifiers, Microwave oscillators, Microwave detectors/mixers and Microwave control circuits. Apply the advanced concepts in Microwaves to analyze Monolithic integrated circuits (MICs), with sinusoidal inputs. Apply microwave processing techniques to complex high frequency circuits and systems.

Course Content:
Unit I: Introduction: RF & Microwave Spectrum, Typical applications of RF and Microwave, Safety considerations.

Unit II: Microwave Waveguide and Waveguide Resonator: Rectangular Waveguide-Design consideration, TE & TM modes, TE10 mode analysis, cut-off frequency, propagation constant, intrinsic wave impedance, phase and group velocity, power transmission, attenuation, waveguide excitation, wall current; Introduction of circular waveguide; Rectangular waveguide resonator- Design consideration, resonant frequency, Q-factor, excitation. Planer Transmission line: Micro-strip lines, coplanar waveguide, Slot line-design consideration, field patterns, propagation characteristics, Comparison for different characteristics of the above mentioned lines.

Unit III: Waveguide Passive Components and Their S-Matrix Representation: N-port networks-Properties of S matrix, Transmission matrix & their relationships; Microwave passive components and their S matrix representation: Attenuators, Phase shifter, Directional coupler, Bethe-hole coupler, Magic tee, hybrid ring, Circulators, Isolators; Design procedure
of filter (maximally flat and equal ripple) using insertion loss method-specification, low-pass prototype design, scaling and conversion, implementation.

**Unit IV: Microwave Tubes:** Electron beam & Field interaction for energy exchange in resonant (two cavity klystron, Reflex Klystron, Magnetron) and non-resonant (TWT &BWO) microwave active devices: Typical characteristics & applications (only physical explanation is required, no mathematical derivation required).

**Unit V: Semiconductor Microwave Devices:** TED (Gunn diode) & Avalanche Transit Time (IMPATT) device, Schottky diode, PIN diode characteristics & applications; Microwave bipolar transistor, Microwave field effect transistor (MESFET).

**Unit VI: Typical Microwave Test Bench and Measurement:** VSWR meter, Tunable detector, Slotted line and Probe detector, Frequency meter, Network analyzer, Measurement of VSWR – low, medium and high, Measurement of power: low, medium and high, Frequency measurement.

**Text Books:**
1. Microwave Engineering, 3Rd Ed David M. Pozar, Willey & Sons Inc.
3. Microwave Engineering, A Das & S Das, TMH.
4. Microwave Devices & Circuits, SY Liao, Pearson Education /PHI

**Reference Books:**
1. Microwave Engineering-Passive Circuits, PA Rizzi , Pearson Education.
Course Description

Title of Course: MIMO Systems  
Course Code: 14B14EC849  
L-T-P scheme: 3-0-0  
Credit: 3

Prerequisite
Students must have already registered for the course, “Electromagnetic Fields”, “Digital Signal Processing” and “Wireless Communication”.

Objective:
The objective of this course is to present the key theoretical concepts of MIMO wireless channels and STC with applications to future generations of wireless networks.

Learning Outcomes:
The students must be able to describe the problem that confronts the designer when the technologies are passing on to future technologies in the Wireless Communication area, be able to describe how to enhance the capacity of the complex wireless communication system with less requirement of Bandwidth.

Course Content:
Unit I: Brief history of array processing, Microwave Multi-port Networks with port networks and port Excitation. Fundamental properties and models of MIMO systems, Space time Wireless Channels for multi-antenna systems, Multiple Antennas in wireless systems, Principle of Diversity, Multiplexing Capability, SIMO, MISO, MIMO systems, Multiple antenna Techniques in commercial wireless systems.

Unit II: Introduction to Space-time Processes, Choice of Coordinate system and vector analysis, Electromagnetic Waves propagation through MIMO channels, Orthogonality of signals, Signal Projection. Space time coding.

Unit III: Introduction, Multidimensional channel modeling: The double directional channel impulse response, Multidimensional correlation functions and stationary forms, Channel Fading, Power Delay and direction spectra, Double directional propagation to MIMO channels, statistical propriety of the channel matrix, discrete channel modeling. Empirical models, Standardized models.

Unit IV: General representation of correlated MIMO channels, Rayleigh fading channels, Rician Fading channels, Dual Polarized Channels, Double Rayleigh Fading model, Kronecker model, Virtual channel representation, Eigen beam model, Measuring the Non-stationarity of MIMO channels, Relation between physical and Analytical model.

Unit V: Capacity of fading channels: with perfect transmit channel knowledge, with partial transmit channel knowledge. Mutual information and capacity of Rayleigh and Rician channels with partial transmit channel knowledge. Mutual information in some particular channels. Outage capacity and diversity multiplexing trade-off.

Unit VI: Space time Encoder, Design methodology, Spatial Multiplexing/V-BLAST, ML decoding, Sphere decoding, Zero forcing receiver, MMSE receiver, D-BLAST, OSTBC,
QOSTBC, Linear dispersion codes. Space time Trellis codes, Space time coding for frequency selective channels.

**Text Books:**
1. Smart Antenna Engineering – By Ahmed El Zooghby
2. Space-Time Processing for MIMO Communications – By A.B.Gershman and N.D.Sidiropoulos.

**Reference Books:**
Course Description

Title of Course: Image and Video Coding Standards
Course Code: 14B14EC850
L-T-P scheme: 3-0-0
Credit: 3

Prerequisite
Students must have the knowledge of Image Processing and Digital Signal Processing.

Objective:
Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-D filtering, image decimation/interpolation, multi-resolution representations, edge detection, image enhancement, noise filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, de-interlacing, video resolution enhancement, lossless image compression including entropy coding, lossy image compression, video compression techniques, and international standards for image and video compression (JPEG, JPEG 2000, MPEG1/2/4, H.264, SVC).

Learning Outcomes:
The students will be able to obtain noiseless coding, Huffman, arithmetic, still image coding-JPEG, coding for video conferencing H.261, coding of moving pictures for storage-MPEG-1, coding of high quality moving pictures MPEG-2, low bit rate communications coding H.263.

Course Content:
Unit I: Review of z-transforms, regions of convergence, z-transform properties, 2-d filter stability, Fast DFT algorithm.

Unit II: Two-Dimensional Systems: Sampling in two dimensions, two-dimensional signals and systems, 2-D discrete-space fourier transform, sampling theorem - rectangular case, general regular case, change of sample rate, sample rate change - general case, linear spatial or 2-D systems.

Unit III: 2-D Discrete-Space Transforms: Discrete fourier series, discrete fourier transform, 2-d discrete cosine transform, sub-band/wavelet transform (SWT), sectioned convolution methods.

Unit IV: Image Estimation and Restoration: 2-d random fields, estimation for random fields, 2-d recursive estimation, inhomogeneous Gaussian estimation, estimation in the sub-band/wavelet domain, Bayesian and map estimation, image identification and restoration, image super resolution, color image processing.

Unit V: Digital Image Coding: Transformation, Quantization, Entropy Coding, DCT Coder, SWT Coder, JPEG image compression, JPEG-2000 image compression, Color Image Coding, Directional Transforms, Robustness Considerations

Three-Dimensional and Spatiotemporal Processing: 3-d signals and systems, 3-d sampling and reconstruction, spatiotemporal signal processing, spatiotemporal Markov models, digital video processing: inter frame processing, motion estimation and motion compensation, motion-compensated filtering, Bayesian method for estimating motion, restoration of degraded video and film, super-resolution of video.

Video Transmission over Networks: video on IP networks, robust SWT video coding, error-resilience features of H.264/AVC, joint source-network coding

Text Books:

Reference Books:
Course Description

Title of Course: Soft Computing
Course Code: 14B14EC851
L-T-P Scheme: 3-0-0
Credits: 3

Objectives:
This course aims to develop students' abilities in using some contemporary approaches in solving problems in automation.

Learning Outcomes:
It will enable students to:
1. Appreciate the advantages and limitations of fuzzy systems and their potential impacts and applications in intelligent control and automation;
2. Appreciate the advantages and limitations of neural networks and their potential impacts and applications in intelligent automation; and
3. Develop an understanding of generic algorithms and their potential applications.

Course Contents:
Unit II: Back-propagation Networks, Associative Memory.
Unit IV: Genetic Modeling, Integration of Neural Networks, Fuzzy Logic, and Genetic Algorithms.

Text Book:

References Book:
Course Description

Title of Course: Java Programming
Course Code: 14B14CI856
L-T-P scheme: 3-0-0
Course Credit: 3

Prerequisite:
Students must have the knowledge of, “OOPS”.

Objective:
1. To learn the Java programming language fundamentals: its syntax, idioms, patterns, and styles.
2. To learn object oriented programming concepts.
3. To learn the essentials of the Java class library.

Learning Outcomes: At the end of the course students should be able to:
1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. Have a Good grounding for the design of object oriented concepts in JAVA.
2. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Contents:

Unit I: Introduction to computers, programs and Java, Net Beans (or other IDE) Tutorial.
Unit II: Primitive Data Types and Operations. Selection Statements and Program Control (e.g., loops). Objects, Classes, and Methods. Arrays and Iteration Strings and Text I/O.
Unit III: Getting Started with GUIs Event Handling. Creating User Interfaces. Project: one or a combination of Applets and Swing, Graphics,
Unit IV: Three Level (GUI, Business Rules, Database Access) Enterprise Applications.

Text Books:
3. Hans Bergsten, “Java Server Pages”, SPD O’Reilly

Reference Books:
2. Internet & World Wide Web How to Program / Deitel, H.M.
3. Web Design with HTML/Flash/Java Script and E-Commerce Bible / Crowder, David
4. Database Driven Web Sites / Feiler, Jesse
5. Web design: the complete reference / Powell Thomas A

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Course Description

Title of Course: Game Theory
Course Code: 14B14MA745
L-T-P Scheme: 3-0-0
Credit: 3

Objective:
The main objective of this course is to acquaint the students with the game theoretic reasoning for formulating problems of strategic situations that occur in a variety of engineering contexts as games.

Learning Outcomes:
The students will understand situations in which decision-makers interact. They will also be able to solve some involved engineering problems using game theoretic approach in simpler ways as the nature of computing is changing.

Course Content:

Unit I: Definition and Explanation of Some Important Term in Games, Characteristic of Game Theory, Major Limitation of Game Theory, Co-Operative and Non Co-Operative Games, Zero-Sum & Non-Zero-Sum Games with examples


Unit III: Saddle Point (Equilibrium) Point, Rules of determining a Saddle Point, Optimal Strategies And value Of The Game, (2×2) Two –Person Zero-Sum Without Saddle Points, Value Of A Game, Fair And Strictly Determinable Games.

Unit IV: Definition of Convex Set, Convexity of Set of Optimal Strategies, Games in Coalitional Form of N Person, Constant- Sum Games, Concept of Core of a Game, Concept of Dominance in Games, Inferior and Superior Strategies, Dominance Property, Generalized Dominance Property. Reduction of Size of Game. Graphical Method for (2×N) and (M×2) Games, A Short Cut Method for (N × N) Games.


Unit VI: Linear Programming, Canonical and Standard Forms, Simplex Method, Duality in Linear Programming, Principles of Duality, Importance of Duality, Solution of Two-Person, Zero-Sum Game by Transforming into Linear Programming, Prisoner’s Dilemma (Examples), Elementary Concept of Shapely Value And Nucleolus in Games.

Text Books:
1. Operation Research, By: W.L. Winston, Thomson Publishers
2. Mathematical Methods and Theory in Games, Programming and Economics, By: S. Karlin, Dover Publications, Mineola, Ny

Reference Books
Course Description

Title of Course: Nonlinear Dynamics and its applications  
Course Code: 14M14PH744  
L-T-P Scheme: 3-0-0  
Credit: 3

Objective: Nonlinear optics play a pivotal role in developing modern communication systems. The present course aims to provide a fundamental understanding of nonlinear optics and its possible applications in fiber optics.

Course Contents:


Elementary Nonlinear Optics: Extension of Lorentz model in the nonlinear domain, description of nonlinear optical interactions, nonlinear susceptibility of a Classical Anharmonic Oscillator. Second harmonic generation, sum and difference frequency generation, properties of nonlinear susceptibility, Self-focussing phenomenon etc.


Some Contemporary Developments in the Field: Optical solitons in nonlinear optical fibers, cross-phase modulation (XPM) self-phase modulation (SPM), group velocity dispersion (GVD), four wave mixing (FWM) etc. A brief introduction to materials with negative index of refraction.

Text Books & References:
5. Fundamentals of Photonics, B.E.A. Saleh and M.C. Teich, John Wiley & Sons Inc.
Title of Course: Nano Science and Technology  
Course Code: 14M14PH741  
L-T-P Scheme: 3-0-0  
Credit: 3

Objective: The course aims to provide students understanding of materials and their properties at the atomic level, including an understanding of the intimate relationship between scale and size, nanostructure and the properties of materials.

Learning Outcome: Students will be able to understand properties of materials at nanoscale and apply modern scientific principles and techniques for their preparation, and characterization.

Course Contents:

Text Book

References
2. Nanotechnology basic science & emerging technologies, Kannangar, University of NSW Press.
Course Description

Title of Course: Optimization Techniques  
Course Code: 14M14MA743
L-T-P Scheme: 3-0-0  
Credit: 3

Objective:
To make students aware of the basic mathematical concepts and optimization techniques which will help them in learning courses in engineering and technology.

Learning Outcomes:
At the end of the course, the student will able to solve optimization problems of engineering and allied sciences.

Course Content:
Unit I: Introduction: Formulation of Linear Programming (Lp) And Non-Linear Programming Problems (Nlpp) and Their Graphical Solutions.
Unit II: Simplex Method, Sensitivity Analysis, Duality.
Unit III: Dual Simplex Method, Integer Linear Programming Problems.
Unit IV: Transportation Problems, Assignment Problems, Introduction To Nlps, Kuhn-Tucker Conditions.
Unit V: Quadratic Programming Problems and Their Solutions

Text Books:

Reference Books: