NIRMA UNIVERSITY

INSTITUTE OF TECHNOLOGY

B. Tech. Electronics & Communication Engineering

Syllabus

SEMESTER- I

2PY101 PHYSICS [2 1 2 4]

Course Outcomes (CO):

At the end of the course, students will be able to -

1. Acquire the knowledge of fundamental principles of physics and relate to the engineering science,
2. Apply the concepts of Physics for solving Engineering problems,
3. Relate principles of Physics for solving new and challenging problems of technology.

Syllabus:

Physics of Nanomaterials: Introduction to Quantum Physics: Particle in a three dimensional box, Introduction – Nanoscale; Nanomaterials: Methods for synthesis of nanomaterials, Properties of nanomaterials – Electrical, Magnetic, Optical, Mechanical, Characterization techniques – X ray Diffraction (XRD) - Single Crystal, Powder and Laue techniques, Low energy Electron Diffraction (LEED), Scanning Electron Microscopy, Tunnelling Electron Microscopy, Nanostructures; Carbon nanotubes Characteristics and applications, Nanotechnology and environment.

Lasers and Holography: Introduction, Basics of Interaction of radiation with matter, Condition for light Amplification, Population inversion and metastable state, pumping, the principle pumping scheme: Three and Four level scheme, Construction and working of optical resonator, Optical amplifier, Applications of laser beam, Holography.

Introduction to Fiber Optics: Introduction of fiber-optic system, Principle and construction of fiber cable, Acceptance angle and numerical aperture, Types of Optical fiber: Based on material & based on mode of propagation, Index profile, Fiber optic communication link, Fiber optic sensor, Advantages of fiber optic system.

Nuclear and Plasma Physics: Introduction to nuclear physics, types of nuclear reactions, nuclear reaction cross sections, Radius of Gyration, particle accelerators – pinch of synchrotron radiation, nuclear fission as a source of energy, Nuclear radiation counters – Geiger Mullar Counter, scintillation counter.

Basic concepts of Plasma physics: Introduction to Electrostatics and Electromagnetics, Curl, Divergence and Gradient of fields, Maxwell's equations, Motion of charged particle in E and B homogeneous field, Pinch effect, Magnetic trapping of plasma, Van Allen radiation belt.

Physics of Vacuum Techniques and Cryogenics: Creation of vacuum with different pumps-rotary pump, diffusion pump, Measurement of vacuum with different gauges; Need of vacuum in Plasma unit, Cryogenics – use of liquid Nitrogen and liquid Helium, Applications of cryogenics in refrigeration, space and medical field

Engineering of Auditorium and Ultrasonics: Introduction, Defection due to reflection of sound, Sabine's empirical formula, Reverberation theory, Eyring's equation, Acoustical defects and their remedies, Acoustic materials, Ultrasonic waves, Piezoelectric method, Properties and application of ultrasonic waves

Laboratory Work:

A minimum of 10 experiments based on above syllabus will be arranged.

Self- Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

1. M N Avadhnulu and P. Kshirsagar, A Text Book of Engineering Physics, S Chand.
2. T. Pradeep, Nano: The Essentials, New Central book Agency.
3. S. N. Goswami, Elements of Plasma Physics, Tata McGraw Hill publication.
4. L. Theraja, Physics for Engineers, S Chand Publication

2CY101 Chemistry

At the end of the course, students will be able to –

1. relate the fundamentals and their application in various field of engineering,
2. identify and apply the principles of green chemistry in improving the existing technology,
3. categorize the materials on the basis of their properties,
4. select appropriate method of analysis and interpret its result.

Syllabus:

Water and its Treatment: Introduction, Sources of water impurities, Hardness of water, Degree of hardness, Softening of water, Water treatment processes, Problems with boiler feed water and its treatments Specifications for drinking water (BIS standards)

Fuel: Calorific Value, Types of fuel, Selection of fuels, Analysis of coal:- proximate and ultimate analysis, Flue gases:- Orsat apparatus, Alternative fuels:- Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Ethanol, Bio-diesel

Lubricants: Classification and functions of lubricants, Properties:- lubricating oil and greases, Selection of lubricants

Polymers and Composite materials: Introduction to Polymers and Polymerization, Elastomers, classification and uses, Biopolymers:-Cellulose and starch, Advanced polymeric materials, Composites:- Introduction, classification and applications

Green Chemistry: Overview, Set of Principles of Green Chemistry, Industrial applications.

Engineering Materials: Adhesives:- characteristics, classification, and uses, Fullerenes:- structure, properties and applications, Nanorods:- brief introduction, Organic Electronic Materials:- introduction, types and applications, Liquid Crystals:- Introduction, classification and applications, Explosives:- Introduction, Classification, Characteristics, Disarmament, Weapons of Mass Destruction (WMD), peaceful uses of explosives

Overview of electrochemical systems

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. P.C. Jain and Monika Jain, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
2. Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
3. S.S. Dara, Textbook of Engineering Chemistry, S. Chand and Company.
4. Mike Lancaster, Green Chemistry: An Introductory Text, Royal Society of Chemistry.
5. J.C. Kuriacose and J. Rajaram, Chemistry in Engineering and Technology, Tata Mc Graw Hill.
6. Prasanta Rath, Engineering Chemistry, Cengage Learning.

Sunita Rattan, A Textbook of Engineering Chemistry, S.K. Kataria & Sons

Course Code	2CS101	3	1	2	5
Course Title	Computer Programming				

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. recognize the importance and apply C language constructs in program development,
2. analyse the problem and select the most appropriate method to solve it,
3. evaluate the correctness of the developed solution.

Syllabus:	Teaching hours:
Unit I	5
Introduction to Computers: Introduction to Computers and the Internet in Industry and Research, The Internet and World Wide Web, web Resources, Hardware and Software, Computer Organization, Programming Languages, Introduction to the C Programming Language, Typical C Program Development Environment and steps. Test-Driving a C Application in Linux, Running a C program Using GNU for debugging.	
Unit II	9
Introduction to Programming: Memory Concepts, datatypes, operators and expressions, Decision Making, Bitwise Operators, Flowchart, Algorithms, Pseudocode, Test-cases, Repetition Statement, Counter-Controlled Repetition, Sentinel-Controlled Repetition, Nested Control Statements. Introduction some Simple C Program, I/O handling.	
Programming with C: keywords, syntax and library functions, datatypes, declarative, imperative and decision statements. Control structures.	
Unit III	10
Functions: Math Library Functions, User defined functions, Function Call Stack and Stack frames, Passing Arguments by Value and By Reference, Scope Rules, Recursion, Recursion vs. Iteration.	
Arrays: Defining Arrays, Sorting Arrays, Searching Arrays, Multidimensional Arrays, Variable-Length Arrays, Passing Arrays to Functions.	
Unit IV	11
Pointers: Pointer Variable Definitions and Initialization, Pointer Operators, Passing Arguments to Functions by Reference, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Arrays of Pointers, Pointers to Functions. Introduction to dynamic memory allocation.	
Characters and Strings: Fundamentals of Strings and Characters, Character-Handling Library Functions, String-Conversion Functions, Standard Input/Output Library Functions for string, String-Manipulation Functions of the String-Handling Library, Comparison Functions of the String-Handling Library.	
Unit V	10
Structures: Structure Definitions, Defining Variables of Structure Types, Operations That Can Be Performed on Structures, Initializing Structures, Accessing Structure Members, Using Structures with Functions	
File Processing: Files and Streams, Creating a File, Reading and writing Data from a File.	

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Above concepts are to be implemented in C-language atleast with emphases on logic development and debugging, 10 experiments are to be carried out.

Tutorial Work:

The tutorial work will be based on the topics covered in the syllabus. Minimum 10 tutorials should be carried out.

Suggested Readings^:

1. Deitel and Deitel , C How to Program, Pearson
2. E. Balagurusamy, 'Programming in ANSI C", McGraw Hill
3. Yashwant Kanitker, Let Us C, BPB Publications
4. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India
5. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
6. David Gries, The Science of Programming, Springer
7. Dromey R.G., How to solve it by computers, Prentice Hall of India
8. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
9. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
10. Sedgewick R., Algorithms in C, Addison Wesley
11. Schaum Ourline Series, Programming in C, , McGraw-Hill
12. E. Balagurusamy, Pointer in C, McGraw Hill

L= Lecture, T= Tutorial, P= Practical, C= Credit

^This is not an exhaustive list

L	T	P	C
3	1	0	4

Course Code	2MA201
Course Title	Calculus and Differential Equations

Course Learning Outcomes (CLO)

At the end of the course, students will be able to-

1. apply differential and integral calculus to solve engineering problems,
2. use power series to solve differential equations appears in engineering filed,
3. deal with functions of several variables that are essential in engineering.

Syllabus:

Calculus **Teaching hours: 7**

Evaluation of definite and improper integrals, Beta and Gamma functions and their properties,Applications of definite integrals to evaluate surface areas and volumes of revolutions

Infinite Series **Teaching hours: 7**

Convergence of series, tests for convergence, power series, Taylor's and Maclaurin's series. Series for exponential, trigonometric and logarithmic functions

Multivariable Calculus: Differentiation **Teaching hours: 7**

Limit, continuity and partial derivatives, total derivative and chain rule,Euler's theorem, Taylor's series in two variables, Tangent plane and normal line, Maxima, minima and saddle points Method of Lagrange multipliers

Multivariable Calculus: Integration Teaching hours: 9

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities).

Ordinary Differential Equations **Teaching hours: 10**

Second order linear differential equations with constant coefficients, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties

Partial Differential Equations: First Order Teaching hours: 5

First order partial differential equations, solutions of first order linear and non-linear PDEs

Tutorials

This shall consists of at least 8 tutorials (TA) based on the syllabus

Self-Study

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

1. G B Thomasand R L Finney,Calculus and Analytic geometry; Pearson
2. T Veerarajan,Engineering Mathematics; McGraw-Hill
3. B V Ramana, Higher Engineering Mathematics; McGraw-Hill
4. N P Bali andM Goyal, A text book of Engineering Mathematics; Laxmi Publications

5. B S Grewal, Higher Engineering Mathematics;Khanna Publishers
6. E Kreyszig, Advanced Engineering Mathematics;John Wiley & Sons
7. W E Boyce and R C DiPrima,Elementary Differential Equations and Boundary Value Problems; Wiley India
8. S L Ross, Differential Equations; Wiley India
9. E A Coddington,An Introduction to Ordinary Differential Equations; Prentice Hall India
10. E L Ince,Ordinary Differential Equations; Dover Publications
11. G F Simmons and S G Krantz,Differential Equations; McGraw Hill

L = Lecture, T = Tutorial, P = Practical, C = Credit

2ME101 Engineering Graphics [2 0 4 4]

Course Learning Outcomes:

After successful completion of the course, student will be able to

1. Understanding the fundamental principles of engineering graphics and related drawing standards
2. explain the various methods of producing and presenting graphic information.
3. communicate graphically using traditional means and the computer aided tools.
4. develop capability to visualize and represent geometry in two dimensions and in three dimensions.
5. appreciate role of engineering graphics and modeling for various disciplines of engineering.

Syllabus:

Introduction to Engineering Drawing
Importance and Applications of Engineering Drawing for various branches of engineering, Drawing instruments, BIS Code of Practice, Lines, Lettering and Dimensioning, Scales, Basic Geometrical Construction, Sheet Layout

Engineering Curves
Equations of conic curves and cycloid and their relevance to construction.
Construction of conics by Focus Directrix Method, Construction of Ellipse by Arcs of Circle Method, Parabola by Rectangle Method, Rectangular and oblique Hyperbola.
Construction of Cycloid, Epicycloids and Hypocycloid. Construction of Involutes. Constructions of Archimedean spiral and helix.

Solid Geometry
Concept of Orthographic Projections and Projections of Points, Projections of straight lines inclined to one and both reference planes, Projections of Planes inclined to both reference planes, Projections of solids and sections of solid.

Developments of Surfaces by parallel line method and radial line method.

Interpenetration of Solids
Determination of lines / curves of intersection for interpenetration of Prism to prism, Cylinder to cylinder, Cylinder to cone, Cone to cylinder.

Orthographic Projections
Conversion of pictorial views in to orthographic Projections. Sectional orthographic Projections.

Isometric Projections
Conversion of orthographic views into isometric projections / views.

Computer Aided Drafting Tools
Basic Drawing Creation Tools- creating a line, circle, Arc, Donut, Ellipse, Point, Multi-Line, Polygon, Spline. Using editing tools such as Dividing and Measuring.
Modifying Commands and Views- Rectangular and Polar arrays, modify using BREAK, CHAMFER, COPY, EXPLODE, EXTEND, FILLET, MIRROR, MOVE, OFFSET, PEDIT, ROTATE, SCALE, STETCH, TRIM. Adding Text to Drawings, Dimensioning Tools.

Conventional Representation
Symbols for standard machinery components such as nuts, bolts, locking devices, riveted and welded joints, foundation bolts. Symbols used in electrical, electronics and civil engineering.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory Work will be based on the above syllabus consisting of minimum six drawing sheets.

References:
1. N D Bhatt, Engineering Drawing, Charotar publication
2. K. C. John, Engineering Graphics, PHI Publication.
3. Warren J Luzzader and Jon M Duff, Fundamentals of Engineering Drawing, PHI publication.
4. James D Bethune, Engineering Graphics with AutoCAD® , PHI Publication.
5. IS SP 46 : 2003. Engineering Drawing Practices for Schools and Colleges.

L	T	P	C
3	1	0	4

Course Code	2MA101
Course Title	Linear Algebra

Course Learning Outcomes (CLO)

At the end of the course, students will able to-

1. acquire basic knowledge of matrix theory,
2. comprehend basic concept of vector space and linear transformation,
3. apply the knowledge of linear algebra in engineering problems.

Syllabus:

Matrix Theory **Teaching hours: 23**

Review of algebra of matrices, Rank of matrix, Inverse of matrix by Gauss-Jordan method, Solution of system of algebraic simultaneous equations, Linearly dependent and Linearly independent functions, Caley-Hamilton Theorem (without proof), eigen values and eigen vectors, Eigen values and eigen vectors of orthogonal, symmetric, skew-symmetric matrices, Hermitian matrix, skew-Hermitian matrix, Unitary matrix, Normal matrix, Algebraic and geometric multiplicity, Diagonalization, Spectral theorem for Real symmetric matrices, Application of quadratic forms.

Vector Space and Linear Transformation **Teaching hours: 22**

Definition of vector space, subspaces, linear combination, Linearly dependent and linearly independent vectors, Basis of vector space, Dimension, Rank-Nullity theorem (statement and verification by examples), Definition of linear transformation, types of linear transformations (Rotation, Reflection, Expansion, Contraction, Projection), Matrix of Linear transformations, Change of basis and similarity.

Tutorials

This shall consists of at least 8 tutorials (TA) based on the syllabus

Self-Study

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

1. D C Lay, Linear Algebra and its Application; Pearson Publication
2. E Kreyszig, Advanced Engineering Mathematics; John Wiley Publication
3. H Anton, Elementary linear algebra with applications; John Wiley Publication
4. K Hoffman and R Kunze, Linear Algebra; PHI Publication
5. S Kumaresan, Linear algebra - A Geometric approach; PHI Publication
6. J P Sharma and M Yeolekar, Engineering mathematics Vol-II; PHI Publication

L = Lecture, T = Tutorial, P = Practical, C = Credit

2EE101 ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes (CO)

COs are clear statements of the expectations for student achievements in the course.

At the end of the course, a student will be able to –

1. interpret the importance of electrical energy and relate its usage in various applications,
2. illustrate the role of circuit elements in different system conditions,
3. distinguish the operational aspects of ac-dc systems and comprehend the principles of electromechanical energy conversion,
4. recognise the functions of electronic devices and basic circuits,
5. apply the concepts of number based conversion and Boolean algebra for digital logic design.

Syllabus

Unit	Content	Teaching Hours
Unit - 1	**Review of dc Circuits** Kirchhoff's laws, solution of star-delta circuits, Joule's law of electric heating, relationship between various energy units, charging and discharging of capacitor, series-parallel magnetic circuits, fringing effect, comparison between electric and magnetic circuit, Concept of induced emfs, series-parallel connection of inductors, rise and decay of current in inductive circuit.	10 Skill Dev
Unit - 2	**Single-phase AC Circuits** Generation of alternatingemf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits.	08 Skill Dev
Unit - 3	**Three-phase AC Circuits** Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, power measurement in three-phase circuit, variation in wattmeter reading with power factor.	07 Skill Dev
Unit - 4	**Electromechanical Energy Conversion** Concept of electro-mechanical conversion, energy balance, elementary concept of electrical machines, types of rotating electrical machines.	04 Skill Dev
Unit - 5	**Analog Electronics** Half and full wave rectifiers, special purpose diodes, regulator, BJT and its applications, amplifier, oscillator, overview of opto-electronics devices, opto-couplers, transducers, Operational amplifier, Comparator, Timer IC and multivibrators.	08 Skill Dev
Unit - 6	**Digital Electronics** Number systems and its arithmetic, binary codes, Boolean-algebra & simplification of Boolean expression; logic gates, concept of universal logic; implementation of Boolean expressions using logic gates, application of digital circuits (e.g. adder, subtractor, multiplexer, de-multiplexer, analog to digital converter, digital to analog converter	08 Skill Dev

References

1. B.L.Theraja, A.K. Theraja, Textbook of Electrical Technology Volume I –, S. Chand & Co.
2. A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, Textbook of Basic Electrical Engineering –TMH Publishing Co.
3. U. A. Patel, Textbook of Elements of Electrical Engineering, Mahajan Publishing House, Ahmedabad.
4. J. Nagrath, Basic Electrical Engineering, TMH Publishing Co. Ltd.
5. Vincent Del Toro, Textbook of Principles of Electrical Engg., Prentice Hall of India Pvt. Ltd., New Delhi.
6. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta.
7. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons.
8. Robert Boylestad, Louis Mashlsky, Electronics Devices and Circuit theory, Peerson
9. M. Morris Mano, Digital logic and computer Design, PHI

2EE102 ELECTRICAL WORKSHOP [0 0 2 1]

Course Outcomes (CO)

At the end of the, a student will be able to –

1. identify and propose appropriate electrical and electronic components for relevant applications,
2. select and make use of various laboratory equipment,
3. build simple domestic and industrial wiring systems,
4. apply basic maintenance and troubleshooting skills to house hold electrical appliances,
5. extend the awareness about safe practices in electrical systems.

Syllabus

Unit	Content	Teaching Hours
1	**Wiring Techniques** Designing of domestic and industrial wiring, selection of wire, load calculations	2 Entre
2	**Introduction to Electronic Components** Study of various electronic components like, power and signal diodes, zener diodes, BJTs, FETs, LED, LDR, Photo diode, Photo transistor, SMD components, general purpose ICs, use of bread board	4 Skill dev
3	**Lab Equipment** CRO, DC regulated power supply, function generator, multimeter, single-phase and three-phase auto-transformer (variac)	4 Skill dev
4	**Introduction to Electrical Components** Study of different types of switches, solid state and electromagnetic relays, contactors, rheostats, different types of capacitors, resistors, variable inductor (choke) etc.	4 Skill dev
5	**Soldering Techniques** Basics of soldering techniques, effectiveness of soldering and problem associated with soldering, general purpose board soldering	2 Skill dev, Entre
6	**Basics of Household Electrical Equipment** Rewiring / replacement of fuse, switch board layout, functioning of switch, fan regulator, tube light, electric iron, electric heater	4 Skill dev
7	**Electrical Safety and Protection** Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays	4 Skill Dev, employ
8	**Designing of Electrical Panel**	4

		Basic design steps and criteria, selection of various components, layout of panel, ferruling, crimping, lugging, annunciation, display, mimic, meter mounting etc.	Entre
9		**Introduction to DC Machine** Study of various parts of DC machine. Operation of DC machine as DC motor	2 Skill Dev

References

1. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta
2. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons
3. Sengupta R., Textbook of Principles and Reliable Soldering Techniques, New Age International (P) Ltd
4. B. L. Theraja, A. K. Theraja, Textbook of Electrical Technology Vol – III, S. Chand Publishers., New Delhi
5. K. B. Bhatia, Textbook of Fundamentals of Maintenance of Electrical Equipment Khanna Publishers
6. Er. Mehta S. D., Textbook of Electronic Product Design Vol – I, S. Chand Publishers., New Delhi
7. Dr. S. K. Bhattacharya, Dr. S. Chatterji, Textbook of Projects in Electrical, Electronics, Instrumentation and Computer Engineering, S. Chand Publishers., New Delhi
8. National Electrical Code: Bureau of Indian Standards, Govt. Of India, 2011
9. Operating Manuals of Various Equipment

CE101 Art of Programming [3 1 2 5]

Learning Outcome:

1. Students will get acquainted with basic components and capabilities of a typical computing system.
2. Students will be able to critically think about basic problems and develop algorithms to solve, validate and verify with computing systems.
3. Students will be able to identify appropriate language constructs and approach to computational problems.
4. Students will be acquainted with coding standards including documentation which are required to be used for the development of effective, efficient and maintainable programs.

Syllabus:

Introduction to Computer Systems: Basic computer organisation, operating system, editor, compiler, interpreter, loader, linker, program development.

Data Storage and Operations: Various data representation techniques, data types, constants, variables, arrays, various arithmetic and logical operations in a typical programming environment.

Algorithms and Flow charting: Introduction to computer problem solving, concepts and algorithms and flow chart, tracing of an algorithms.

Algorithm to Program : Specifications, top down development and stepwise refinement as per programming environment needs. Imperative style of correct and efficient programming, introductory concepts of time and space complexities.

Loops and Controls Construct : conditional and unconditional execution. Simple versus nested controls. Various aspects of repetitive executions, iterative versus recursive programming styles, assertions and loop invariants.

Errors and Debugging: Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory.

Structured Programming: Introduction to modular approach of problem solving, concepts of procedure and functions for effective programming.

Coding Conventions: Variable naming, function naming, indentation, usage and significance of comments for readability and program maintainability.

Laboratory Work:

Above concepts are to be implemented in any High Level Programming Language (preferably C-language) atleast 10 experiments are to be carried out.

References:

1. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
2. Dromey R.G., How to solve it by computers, Prentice Hall of India
3. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
4. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
5. Sedgewick R., Algorithms in C, Addison Wesley
6. Yashwant Kanitker, Let Us C, BPB Publications
7. Schaum Ourline Series, Programming in C, , McGraw-Hill
8. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India

Calculus [3 1 0 4]

Learning outcomes:

On completion of the course student

1. will be able to find higher ordered derivatives and hence represent function in power series of (x-a)
2. will apply the knowledge of function of several variables , its derivatives in engineering problems
3. will apply the knowledge of special functions(Gamma, Beta, Elliptic, Error) and its application in engineering problems
4. will apply the knowledge of multiple integration and its application in engineering problems

Syllabus:

Unit I: Differential Calculus Review of limits, continuity and differentiability, Successive differentiation, Leibnitz theorem (without proof), Indeterminate forms, Taylor's and Maclaurin's expansion of single variable, Partial Differentiation, Total derivative, Chain Rule, Implicit function, Euler's theorem and its applications, Taylor's and Maclaurin's expansion of function of several variables, Maxima and Minima of function of several variables, Lagrange's method of undetermined multipliers, Jacobian.

Unit II: Integral Calculus Review of proper and improper integrals, Reduction formulae, Beta-Gamma functions, Error function, Tracing of curves, Rectification, Quadrature, Volume of solid of revolution, Area of surface of revolution, Double integral and evaluation, Change of order of integration, Change of variable, Triple integral and evaluation, Area using double integration, Volume as double and triple integration, Volume of solid by double integration.

References:

1. Thomas' Calculus(Latest edition), Pearson publication.
2. G B Thomas and R. L. Finney, Calculus and Analytic Geometry (Latest edition), Narosa Publication, Delhi.
3. James Stewart, Calculus (Latest edition), Thomson Learning.
4. B. S. Grewal, Higher Engineering Mathematics, (Latest edition) Khanna publication, Delhi.
5. Dr. K. R. Kachot, Higher Engineering Mathematics Vol I (Latest edition), Mahajan Publication, Ahmedabad.
6. Sharma and Yeolekar, Engineering Mathematics Vol. I. (Latest edition), PHI, New Delhi.

EE101 Elements of Electrical Engineering [3 0 2 4]

Learning Outcome:
The course is designed to introduce to a novice about the fundamentals of the electrical engineering. At the end of the course, it is expected that student will be able to express the behavior of basic electrical components like resistor, inductor and capacitor under DC and AC application. The students are exposed to single-phase and poly-phase systems and circuits and shall be able to comprehend the same. The student will be able to appreciate safety requirements and usage of safety devices. The learner will be able to understand and apply the basics of electrical engineering in their respective field of engineering.

Syllabus:

Review of DC Circuits
Resistor, temperature effect on resistance, Kirchhoff's laws, solution of series-parallel and star-delta circuits, Joule's law of electric heating, relationship between various energy units, types of capacitor, charging and discharging of capacitor, fundamentals of magnetic circuits, fringing effect, series-parallel magnetic circuits, comparison between electric and magnetic circuit

Electromagnetic Induction
Faraday's laws of electromagnetic induction, concept of induced emfs, coefficient of coupling, series- parallel connection of inductors, rise and decay of current in inductive circuit, hysteresis and eddy current loss

Single-phase AC Circuits
Generation of alternating emf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits

Three-phase AC Circuits
Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, introduction to rotating vector, power measurement in three-phase circuit, solution of balanced and unbalanced systems

Domestic and Industrial Wiring
Basic domestic wiring methods, types of cable, accessories, PVC conduit and PVC casing, salient features of industrial wiring, consideration on cross sectional area and insulation strength based on voltage and current rating, design calculations, protective systems, Indian standard wiring practices

Electrical Safety and Protection
Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays

Batteries
Different types of batteries, need of batteries, charging and discharging of batteries, methods of charging

Laboratory Work:
This shall consist of at least 10 practicals based on the above syllabus.

References:

1. Electrical Technology, Volume I – B.L.Theraja, A.K. Theraja; S. Chand & Co.
2. Basic Electrical Engineering – A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, TMH Publishing Co.
3. Elements of Electrical Engineering – U. A. Patel, Mahajan Publishing House, Ahmedabad.
4. Basic Electrical Engineering – I. J. Nagrath, TMH Publishing Co. Ltd.
5. Principles of Electrical Engg.– Vincent Del Toro, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Electric Wiring – Mr. S. Samaddar, New central book agency (P) Ltd., Calcutta.
7. Electrical Design Estimating and Costing – Surjit Singh, Dhanpat Rai & Sons.

HM102 English (Foreign Language) [2 0 2 3]

Course Learning Outcome:
By the end of this course

1. Student will be able to understand and speak a new language
2. Student will be more aware about the world outside
3. It will add to the knowledge of culture other than their own
4. Multi-Linguistic skills will equip them with better communication skills too

Syllabus of English Language:
The course content will encompass following topics

Grammar

1. Tenses
2. Helping and Modal auxiliary verb
3. Concords
4. Prepositions
5. Idioms
6. Synonyms –Antonyms
7. Confusables

Prose

- Open Window by Saki
- A Cup of Tea by Katherine Mansfield
- The Piece of String by Guy De Maupassant
- Text of Steve Jobs' Commencement address -2005
- How to be an Alien by George Mikes

Poems

1. Ode to the skylark – by P B Shelley
2. Where The Mind Is Without Fear - by Rabindranath Tagore.
3. The Road Not Taken- Robert Frost
4. On The Move - by Thom Gunn.

Methodology:

Readings, exercises, role plays, videos will be the basic tools for teaching

As the course on foreign language will be offered by different experts, depending on the availability of the experts and demand, the syllabus of the offered foreign language will be approved by the Dean time-to-time before start of the every semester.

References:

1. Leech Geoffery and Svartik Jan, ‘A Communicative Grammar of English’, Pearson pub.
2. Murphy Raymond, ‘Grammar in Use Intermediate with Answers’, Cambridge University Press
3. Selected text in the form of handouts.

HM102 English (Foreign Language) [2 0 2 3]

Course Learning Outcome:
By the end of this course

5. Student will be able to understand and speak a new language
6. Student will be more aware about the world outside
7. It will add to the knowledge of culture other than their own
8. Multi-Linguistic skills will equip them with better communication skills too

Syllabus of English Language:
The course content will encompass following topics

Grammar

8. Tenses
9. Helping and Modal auxiliary verb
10. Concords
11. Prepositions
12. Idioms
13. Synonyms –Antonyms
14. Confusables

Prose

- Open Window by Saki
- A Cup of Tea by Katherine Mansfield
- The Piece of String by Guy De Maupassant
- Text of Steve Jobs' Commencement address -2005
- How to be an Alien by George Mikes

Poems

5. Ode to the skylark – by P B Shelley
6. Where The Mind Is Without Fear - by Rabindranath Tagore.
7. The Road Not Taken- Robert Frost
8. On The Move - by Thom Gunn.

Methodology:

Readings, exercises, role plays, videos will be the basic tools for teaching

As the course on foreign language will be offered by different experts, depending on the availability of the experts and demand, the syllabus of the offered foreign language will be approved by the Dean time-to-time before start of the every semester.

References:

1. Leech Geoffery and Svartik Jan, ‘A Communicative Grammar of English’, Pearson pub.
2. Murphy Raymond, ‘Grammar in Use Intermediate with Answers’, Cambridge University Press
3. Selected text in the form of handouts.

HM111 French Language (Foreign Language) [2 0 2 3]

Course Learning Outcomes:

At the end of the 40 hours course, students will be evaluated on the basis of 4 competences:

1. Writing (Filling forms, post cards, small emails, messages),
2. Speaking (To present oneself in details, to be able to ask questions in certain given situations, Role Play),
3. Written Comprehension (Small texts, post cards, messages),
4. Oral Comprehension (Understanding the basic day to day conversations).

Pedagogy: Communicative and Action Oriented Approach

Supplementary:
Cultural activities of Alliance Française d'Ahmedabad.

COURSE CURRICULUM

Main guidelines

1) To introduce oneself
2) To ask information about someone
3) To count
4) To communicate in a class
5) To Greet
6) To take leave
7) To ask personal information
8) To ask politely
9) To give personal information
10) To ask the price
11) To ask about likings
12) To express about our likings
13) To talk about a city
14) To name and find out different places in a city
15) To ask and give an explanation
16) To thank and to reply
17) To write a message
18) To give impressions about a place
19) To talk about ones' activities
20) To say where we live
21) To talk about the weather
22) To fix or postpone a meeting
23) To talk briefly about oneself
24) To ask the time and the timings
25) Telephonic conversation
26) To talk about the family
27) To talk about seasons
28) To understand simple information about the weather
29) To appreciate
30) To precise the quantities
31) With relevant vocabulary and grammar points.

HM131 German Language (Foreign Language) [2 0 2 3]

Course Learning Outcomes:

On completion of the course, the student would be able to:

1. understand & convey expressions associated with everyday routine and topics related to direct circumstances and common requirements in Germany (e.g. seeking and sharing personal information, handling simple conversations related to shopping, making reservations, ordering in restaurants, airports, banks, railway stations, universities and other all such public places).
2. get an insight into the day-to-day socio-economic culture of Germany.
3. appreciate a foreign culture and the importance of learning a foreign language.
4. understand and put basic German grammar such as various types of verbs, nouns, adjectives, tenses and cases to practical & functional use.
5. read, write, speak and understand elementary German and be able to hold simple, short conversations confidently.

Themes & Topics Covered:

1. German Greetings & Good-bye's
2. Introduction (Seeking introductions & introducing yourself thoroughly in German)
3. Orientation: Learning directions & interpreting city plans (Finding your way in the city, inquiring about places, communicating with localities, making basic conversations in Post Offices, Airports, Railway Stations & public places)
4. Learning Countries, States & Capitals
5. Professions
6. Making reservations: Hotels, Taxis & other such routine bookings
7. Placing order in Restaurants & learning to find your way around routine requirements
8. Learning time, dates, days of the week, numbers & occasions/festivals.

Grammar Covered:

Nouns- In depth study of nouns, with emphasis on case-specific changes

1. Verbs- Regular, Irregular, Helping, Separable & Modal verbs. All with their conjugations
2. Subjects- Nominative and accusative. Correlation between a subject & a verb
3. Cases- Nominative, accusative & dative. Effect of each on nouns & the corresponding changes
4. Articles- Definite & indefinite articles. Its impact & ultimate effect on cases
5. Sentences: Imperative, declarative, exclamatory & interrogative. Positive & negative sentence construction shall also be covered (e.g: "Ja", "doch", as well as " nein", "nicht" & "kein" respectively)
6. Concepts such as adjectives, possessive pronouns, prepositions & adverbsSentence Construction

Course Code	EC101
Course Title	Introduction to Electronics and Communication Engineering

Course Learning Outcome:
At the end of the course, students will be able to -

1. recognize core components of electronics and communication engineering,
2. understand the role of electronics and communication engineer in society
3. exploring opportunities and future trends of electronics and communication engineering

Unit No.	Syllabus	Teaching hours: 15
I.	**About Engineering:** Definitions, History, Quality attributes, Role in the society	02
II.	**Introduction:** Introduction to Electronics and Communication Engineering, Historical development, Role and Responsibility of EC Engineer.	02
III.	**Aspects of EC engineering:** Electronics Circuit Design, Embedded System Design, Communication Engineering, VLSI Design, Digital Signal Processing.	03
IV.	**Emerging Trends:** FPGA basics, Next Generation Telecommunication Technologies, Spintronics, Wearable electronics, High Performance Computing, Mobile computing	02
V.	**Interdisciplinary approach:** Artificial Intelligence, Image processing and Computer Vision, Internet of Things, Cyber physical system	02
VI.	**Career Opportunities:** Defense and Space applications, Automation and Robotics, Telecommunications, Electronics system design, R & D Labs, MNCs.	02
VII.	**Case study:** Case study based on evolution and application of Electronics & Communication Engineering	02

Self Study:

1. Electronics and Communication applications to achieve the sustainable goals for the world
2. Computational tools for EC Engineering

Suggested Readings:

1. Saeed Moaveni, Engineering Fundamentals: An Introduction of Engineering, Cengage Learning
2. Quamrul H. Mazumdar, Introduction to Engineering: An Assessment and Problem Solving Approach, CRC Press
3. Magazine: Electronics for You
4. Magazine: Embedded for You
1. Magazine:IEEE Navigator
2. Communication Today
3. IEEE Spectrum (spectrum.ieee.org)

www.weforum.org

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Course Code	**2EC301**
Course Title	**Electronic Devices and Circuits**

Course Outcomes (COs):

At the end of the course, students will be able to

1. Apply the concept of semiconductor physics and basic electronic devices to design various circuits
2. Analyze and design electronic circuits using BJT
3. Comprehend the operation of MOSFET
4. Design, implement and test basic electronic circuits

Syllabus: **Teaching Hours:**

UNIT-1: Semiconductor Diode **10**

Open-circuited PN junction, P-N junction as a rectifier, Current components in a PN junction diode, Volt-Ampere characteristics, Photo-diode, Temperature Dependence of diode characteristic, Transition capacitance, Diffusion capacitance, Diode resistance, Charge control description of a diode, Rectifiers with filters, clipper and clamper circuits

UNIT-II: Bipolar Junction Transistors **10**

Transistor characteristics, Transistor currents component, Transistors biasing and thermal stabilization, , Transistor as an amplifier, Bias compensation, Hybrid model, Analysis of amplifier circuit using h-parameters, Miller's theorem, power amplifiers

UNIT-III: Feedback Amplifier **08**

Feedback concept, Transfer gain with feedback, General characteristics of negative and positive feedback amplifiers, Oscillators

UNIT-IV: Metal Oxide Semiconductor (MOS) physics and MOSFET **15**

General considerations of MOS, MOS I-V Characteristics fundamental of MOS Diode, MOSFET, Effect of Gate & Drain voltage on mobility, Biasing for MOSFET, Channel length modulations, MOSFET break drown & punch-through effect, sub threshold current, MOSFET Scaling, Threshold voltage of Short-channel MOSFETs, Small Signal Analysis, Basics of MOS model

UNIT-V: CMOS Processing Technology **02**

Wafer processing, Photolithography, Oxidation, Ion implantation, Deposition and etching, Device fabrication, Interconnects.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings :

1. S. M. Sze and K. N. Kwok, Physics of Semiconductor Devices, John Wiley &Sons, 2006.
2. Sendra & Smith, Microelectronic Circuits: Theory and Applications, Oxford press
3. Boylestead & Nashelsky, Electronics Devices and Circuits Theory, PHI

4. Millman & Halkias, Electronic Devices and Circuits, McGraw Hill
5. Sung Mo kang, Yusuf Leblebici, CMOS Digital Integrated circuits, Analysis and Design, TATA McGraw-Hill
6. David A. Bell, Electronic Devices and Circuits, Oxford Universitypress

EC302 Digital Circuits [4 0 2 5]

Course Learning Outcome:

After successful completion of this course, students will be able to

1. Apply the concepts of number base conversions
2. Understand the operation of various digital building blocks
3. Design basic combinational and sequential circuits
4. Design a small Arithmetic and Logic unit
5. Understand the architectures of various data converters

Syllabus:

Number System: Decimal, Binary, Octal, Hexadecimal number system, Conversion of numbers from one number system to other, complement method of subtraction, 9's and 10's compliment method, 1's and 2's complement method, Floating point numbers.

Binary Codes: Weighted and Non-weighted code, Self complementing course, cyclic course, 8421 BCD code, XS-3 code, Gray code, Binary to Gray conversion, Gray to Binary conversion, Parity bit and its importance in error detecting.

Logic Gates: AND, OR, NOR, NOT, NAND, X-OR, Inhibit circuits.

Boolean Algebra: Axioms and laws of Boolean algebra, D'morgans theorem, Duality, Reduction of boolean expression, converting AND/OR/INVERT logic to NAND/NOR logic Simplification of Boolean expression using Karnaugh Map and Quine- Mcclusky Methods Expansion of a boolean expression to SOP and POS form, Minimization of POS and SOP expressions for 2 to 6 variables, Don't care conditions, Combinational logic, Quine- Mcclusky methods.

Combinational Circuits: The Half-adder, The Full-adder, The Half-subtractor, The Full-Subtractor, Parallel

Binary Adders, The Look-Ahead Carry Adder, IC Parallel Adders, Two's Complement Addition And Subtraction Using Parallel Adders, Serial Adders, BCD adder, Binary Multipliers, Code converters, Parity bit Generators/Checkers, Comparators, IC comparators, Decoders, BCD to 7-Segment Decoders, Display devices, Encoders, Keyboard Encoders, Priority Encoders, Multiplexers, Applications of Multiplexer, Demultiplexers

Flip-Flops and Timing Circuits: S-R Flip-flop, JK Flip-flop, D Flip-flop, T Flip-flop, Edge –Triggered Flipflop, Master-slave Flip-flop, and Applications of Flip-flops.

Shift Registers: Serial-in Serial-out Shift register, Serial-in Parallel-out Shift register, Parallel-in Serial-out Shift register, Parallel-in Parallel-out Shift register, Bi-directional shift register, Universal shift register, Dynamic shift register, Applications of shift registers.

Counters: Asynchronous counter, Design of Asynchronous counter, Effect of Propagation Delay in Ripple counter, Decoding of Ripple counters, Integrated circuit Ripple counters, Synchronous counters, Design of Synchronous counter.

MSI & LSI circuits and their Applications: Introduction, Examples of Useful Digital Circuits, Arithmetic Circuit, Comparators, Multiplexers, Code Converters, Wired Logic, Practical Aspects of Wired Logic and Bus Oriented Structures.

Logic Families: Digital IC specification terminology, Logic families, TTL, Open collector gate, TTL subfamilies, IIL, ECL, MOS, CMOS, Dynamic MOS Logic

Memories and Programmable Logic Devices: Memory types and terminology, Read Only memory, Semiconductor RAMs, Non-volatile RAMs, Sequential memories, Magnetic memories, Optical Disk memory, Charge coupled devices, Programmable Logic Devices – PROM, PLA, PAL, CPLD, FPGA

Analog To Digital And Digital To Analog Converters: Digital to Analog Conversion, R-2R ladder type DAC, Weighted resistor type DAC, Switched current source type DAC, Switched capacitor type DAC, Analog to Digital Conversion, Counter type A/D converter, Tracking type A/D converter, Flash-type A/D converter, Dual slope type A/D converter, Successive approximation type ADC.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. M. Morris Mano, Digital logic and computer Design, PHI
2. Anand Kumar, Fundamentals of Digital Circuits, PHI
3. R.P.Jain, Digital Electronics, TMH
4. Somanathan Nair, Digital Electronics and Logic Design, PHI
5. Thomas A. Demassa and Zack Ciccone , Digital Integrated Circuits, Wiley Publications

IC321 Linear Control System [3 0 2 4]

Course Learning Outcome:

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

1. To understand and differentiate the basics of linear time-invariant control system
2. To apply basic laws of Newton and kirchhoff to model the liner control system
3. To model physical control system with the understanding of dynamics using different modeling techniques
4. To understand and analyze feedback characteristics of liner control system to reduce the disturbance
5. To understand and analyze time response of first and second order control systems for different standard test signals
6. To analyze the stability of linear control system
7. To perform time domain analysis of linear control system using root locus
8. To perform frequency domain analysis of linear control system using bode plot, polar plot and nyquist stability criterion
9. To understand, analyze and apply basics of state space for linear time-invariant control system

Syllabus:

Introduction to Control Systems: Introduction, examples of control systems, closed loop control versus open-loop control.

Mathematical Modeling of Dynamic Systems: Introduction, modeling of mechanical, electrical and electromechanical systems and determination of transfer function, systems analogy.

Block Diagrams and Signal Flow Graphs:

Feedback Characteristics of Control System: Feedback and non-feedback systems, reduction of parameter variation by use of feedback, Disturbance reduction using feedback control.

Transient Response Analysis: Introduction, First order systems, second order systems, Steady state error for unity feedback system, type of system & error constant, transient response analysis.

Stability: Introduction, R-H criterion.

Root locus Analysis: Introduction, root locus plots, summary of general rules for constructing root loci, root locus plots with matlab, special cases, root locus analysis of control systems, root loci for systems with transportation lag, root contour plots, stability analysis.

Frequency Response Analysis: Introduction bode diagrams, polar plots, nyquist plots, nyquist stability criterion, stability analysis, relative stability, closed loop frequency response, experimental determination of transfer functions.

State Space: Concept of state variable and state model, state model of electrical systems, state model of mechanical systems, conversion of state model into transfer function, canonical state models and its transformations, solution of time invariant state equation, controllability and observability.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. I.J. Nagrath & M. Gopal, Control System Engineering, New Age international
2. K. Ogata, Modern Control Engineering, PHI
3. B.C.Kuo, Automatic Control Systems,PHI
4. Raven, Automatic control Engineering, McGraw Hill
5. B.S.Manke, Linear Control Systems, Khanna Publishers

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Course Code	**2EC304**
Course Title	**Network Theory**

Course Outcomes (COs):

At the end of the course, students will be able to -

1. Analyze the steady state and transient behaviour of components
2. Apply basic laws to analyze various circuits in time domain as well as frequency domain
3. Synthesize an electrical network from given impedance/admittance function

Syllabus: **Teaching Hours:**

UNIT I: Development of the Circuit Concept **12**

Conventions for describing networks, network Equations Kirchhoff's Law, source transformations, examples of the formulations of networks, loop variable analysis node variable analysis, determinants: minors and the gauss method, duality, state variable analysis, Initial conditions in elements, procedure for evaluating initial conditions, Steady state sinusoidal analysis using phasors.

UNIT II: The Laplace Transformation **10**

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

UNIT III: Network Theorems **06**

Thevenin, Norton, superposition, maximum power transfer, reciprocity etc theorems.

UNIT IV: Network Functions **05**

Poles and Zeros terminal pairs or port network functions for the one port and two port, the calculation of network functions, ladder network general networks, poles and zeros of network functions, restrictions on pole and zero locations for transfer functions

UNIT V: Two Port Parameters **08**

Relationship of Two-port variables, short-circuit admittance parameters, the open circuit impedance parameters, transmission parameters, the hybrid parameters, relationships between parameters sets, parallel connections of two-port networks

UNIT VI: Network Synthesis **04**

Properties of positive real function, necessary and sufficient conditions, basic synthesis procedure, synthesis of L-C, R-L and R-C driving point functions.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings :

1. Ravish R. Singh, Electrical Networks, Tata McGraw-Hill Publishing Company Limited
2. M.E. Vanvalkenburg, Network Analysis, PHI
3. Ravish R. Singh, Network Analysis and Synthesis, McGraw-Hill Publishing Company Limited
4. F. F. Kuo, Network Analysis, John Wiley
5. A William Hayt, Engineering Circuit Analysis, McGraw-Hill Education L = Lecture, T = Tutorial, P = Practical, C =creditt

Course Code	2EC303
Course Title	Digital Logic Design

Course Outcomes (COs):

At the end of the course, students will be able to -

1. Design and optimize combinational and sequential circuits
2. Apply the concept of finite state machines for digital system design
3. Design digital systems using Hardware Description Language on reconfigurable devices

Syllabus: **Teaching Hours:**

UNIT I: Boolean Expression Optimization

K-map and minimization of POS and SOP expressions for 2 to 6 variables, Don't care conditions, Advanced K-map, Quine- Mcclusky methods for optimization. **8**

UNIT II: Fundamental of Combinational Circuits

Basics of Combinational logic design, Adder and Subtractor, Parallel adders, Two's Complement Addition and Subtraction using Parallel adders, BCD adder, Code converters, Parity bit Generators/Checkers, Comparators, IC comparators, MSI and LSI logic circuits and application, Hazards in Combinational Circuits. **12**

UNIT III: Flip-Flops

Introduction to sequential circuits, S-R Flip-flop, D Flip-flop and JK Flip-flop, T Flip-flop and Race around conditions, Edge –Triggered Flip-flops, Master-slave Flip-flop. **8**

UNIT IV: Synchronous Finite State Machine

Design and analysis of synchronous sequential circuits, Design of Melay and Moore based FSM, Optimization of Finite State Machines, Timing issues in sequential machines, Synchronous and Asynchronous counter design, Special counters' design, Shift registers. **10**

UNIT V: Asynchronous Finite State Machine

Design and Analysis of asynchronous sequential circuits, Design issues in asynchronous FSM. **5**

UNIT VI: Programmable Logic Devices

Simple Programmable Logic Device, Sequential PLD, Reconfigurable device architectures. **5**

UNIT VII: Logic Families

Digital IC specification terminology, TTL, CMOS. **2**

UNIT VIII: Hardware Description Languages (Verilog)

Fundamentals of Verilog, Overview of digital design with Verilog HDL, Hierarchical modelling concepts: Top-down and bottom-up design methodology, Modules and Port, Gate- Level Modelling, Dataflow Modelling, Behavioral Modelling, Structural Modelling, Task and Function. **10**

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Readings :

1. M. Morris Mano, Digital logic and computer Design, PHI
   A. Anand Kumar, Fundamentals of Digital Circuits, PHI
2. Thomas A. Demassa and Zack Ciccone, Digital Integrated Circuits, Wiley Publications
3. Charles H. Roth, Jr. Lizy Kurian and John Byeong Kil Lee, Digital Systems Design using Verilog, Cengage Learning India, 2016.
4. Samir Palnitkar, Verilog® HDL: A Guide to Digital Design and Synthesis, Prentice Hall PTR.

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Course Code	2EC305
Course Title	Digital DesignLaboratory

Course Outcomes (COs):
At the end of the course, students will be able to -

1. Design digital circuits using MSI/LSI logic components
2. Implement digital circuits on reconfigurable hardware using HDL

Lab experiments based on various combinational and sequential circuits using MSI/ LSI chips, variants of latch and flip flops, various combinational and sequential circuits using HDL and Project.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings :

1. Samir Palnitkar, Verilog® HDL: A Guide to Digital Design and Synthesis, Prentice Hall PTR.
2. Charles H. Roth, Jr. Lizy Kurian and John Byeong Kil Lee, Digital Systems Design using Verilog, Cengage Learning India
3. Michael D. Ciletti, Advanced Digital Design with the Verilog HDL, PHI
4. Joseph Cavanagh, Digital Design and Verilog HDL Fundamentals, CRC Press
5. Pong P. Chu, FPGA Prototyping by Verilog Examples, Wiley

MA303 Vector Calculus, Complex Variables and Differential Equations [3 1 0 4]

Course Learning outcomes:

After successful completion of the course, the students will be able to

1. Evaluate line, surface and volume integrals in simple coordinate systems
2. Calculate gradient divergence & curl in Cartesian and other simple coordinate systems
3. Establish identities connecting these quantities
4. Have knowledge of Green's, Gauss and stoke's theorems
5. Have knowledge of irrotational, solenoidal & conservative vector fields
6. Know analytic function conformal transformations, Cauchy's Theorem & Cauchy's integral formula
7. Express physical phenomenon in mathematical formulation
8. Understand and solve differential equations

Syllabus:

Vector Calculus: Reorientation, Differentiation of Vectors, Scalars and vector fields, Gradient of a scalar function, Directional derivative, Divergence and Curl of a vector function and their physical meanings, Irrotational, Solenoidal and conservative vector fields, Line, Surface and Volume integrals, Green's theorem, Gauss and Stoke's theorems (Without proof).

Functions of Complex Variables: Reorientation, Analytic function, Cauchy – Riemann equation (Cartesian and Polar forms), Harmonic functions, Conformal mappings, Complex integration, Cauchy's theorem and integral formula.

Differential Equations: Definition. Formation of Differential equation. Order and degree of differential equation, Linear differential equation of higher order. Rules for finding complementary function. Method of undetermined coefficients, Method of variation of parameter. Cauchy's & Legendre's equations

Partial Differential Equations: Formation of Partial differential equations, Directly integrable equations, Langrange's equation. Method of separation of variables. Applications to the Wave equation and Laplace equation.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley
2. Peter V. O'neil, Advanced Engineering Mathematics, Thmoson Books/Cole, Singapore.
3. M.J. Ablowitz& A.S. Fokas, Complex variables – Introduction & Application, Cambridge University Press
4. Dr.B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi.

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Course Code	2MA304
Course Title	Vector Calculus, Complex Variables and Probability Distribution

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. comprehend and apply probability distribution and random process in engineering problems
2. apply function of complex variables in engineering field
3. use vector calculus in engineering field

Syllabus: Teaching hours:

Unit I **7**

Vector Calculus: Differentiation of Vectors, Scalars and vector fields, Gradient of a scalar function, Directional derivative, Divergence and Curl of a vector function and their physical meanings, Irrotational, Solenoidal and conservative vector fields

Unit II **10**

Function of Complex Variables: Analytic function, Cauchy – Riemann equation (Cartesian and Polar forms), Harmonic functions, Conformal mappings, Complex integration, Cauchy's theorem and integral formula

Unit III **5**

Statistics: Measure of Central Tendency and Dispersion, Correlation and Regression

Unit IV **11**

Theory of Probability and distributions: Permutations & Combinations, Definition of probability, Application of permutations and combination, Conditional probability, Bayes' Theorem, Concept of random variable, Probability density and distribution functions, Mean and Variance, Moments, Probability distribution, Binomial, Poisson and normal probability distributions

Unit V **6**

Function of random variables: The random variable g(X), the distribution of g(X), mean and variance, moments, characteristic functions, bivariate distribution, one function of two random variables, two functions of two random variables, joint moments, conditional distribution, and conditional expected values

UnitVI **6**

Random processes: Definitions and classification of random processes, stationary and ergodic processes, discrete and continuous processes, Markov chain

Tutorials:

This shall consists of at least 8 tutorials based on the syllabus.

Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings^:

1. A. Papoulis and S. Unnikrishna Pillai, Probability, Random variables and Random Processes, Tata McGraw Hill.
2. S C Gupta and V. K .Kapoor, Fundamentals of Mathematical Statistics: S Chand
3. Jay I. Devore, Probability and Statistics for Engineers and Scientists; Pearson
4. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
5. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Publications.

L = Lecture, T = Tutorial, P = Practical, C = Credit
^ this is not an exhaustive list

SS341 Economics for Engineers [2 - - 2]

Course Learning Outcome (CLO):

After successful completion of the course, students will be able to

1. understand the basic economic theory and economic way of thinking
2. analyze macro - economic policies
3. evaluate the economic efficiency in engineering projects

Syllabus

Module: - 1 MICRO ECONOMICS

1. Basic Economic Concepts: Meaning and understanding of basic economic concepts

2. Demand and Supply: Meaning and Determinants of Demand and Supply, Law of Demand and Supply, Elasticity of Demand and Supply.

3. Production Function: Meaning, production with one variable input, the law of variable proportion, the laws of returns to scale. Economies of Scale

4. Cost Function: Different types of costs, the short run and long run cost functions.

5. Market Structure: Meaning and characteristics of different types of market –
Perfect Competition
Monopoly
Monopolistic Competition and
Oligopoly

Module-2 MACRO ECONOMICS

6. Introduction to Macro Economics: Basic Macro Economic Concepts, National Income Accounting, Concepts of National Income and Methods of National Income Computation

7. Inflation: Meaning, types, causes, effect and remedial measures.

8. Money and Banking: Meaning and Functions of money, Money Supply, Commercial Banks and Central Bank-Meaning and Functions

9. Public Finance: Government Expenditure, Receipts, Budget and Deficits.

Self -Study: The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Books:

(1) Micro Economics Robert S Pindyck, Daniel L Rubinfeld, Prem L Mehta - Pearson
(2) Principles of Economics N.Gregory Mankiw, Thomson South Western , Pearson
(3) Modern Economics – H.L.Ahuja – S.Chand & Company
(4) Macro Economics – Rudiger Dornbush, Stanley Fisher, Richard Startz – Tata Mc-Graw-Hill
(5)Principles of Macro Economics, C.Rangarajan and B.H.Dholakia, The McGraw Hill
(6) Economics , Samuelson and Nordhaus, Tata McGraw Hill
(7) Managerial Economics: Principles and Worldwide Applications, Dominick Salvatore, Adapted by Ravikesh Srivastava, Oxford University Press

List of Journals/Periodicals/Magazines/Newpapers: Economist, Indian Economic Review, Asian Economic Review, American Economic Review, Economic and Political Weekly (EPW), Economic Times, Business Standard etc.

Websites Recommended: www.finmin.nic.in

www.rbi.org.in
www.planningcommission.nic.in etc.

SS342 ICT Tools & Security [0 0 2 1]

Course Learning Outcome:

After successful completion of this course, student will be able to

- identify various modern ICT based tools and technologies
- understand features of the tools which are useful for academic/research/application development
- use ICT based tools for programme specific applications
- understand the vulnerabilities in the system and protect themselves from the attack

Syllabus:

Appropriate IT security aspect as per latest vulnerabilities and appropriate number of tools are to be identified and studied as per programme specific needs, to be decided by the respective Course Coordinator and to be approved by Dean, FoTE before commencement of the course.

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Course Code	2HS342
Course Title	Principles of Economics

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. interpret the various basic economic principles
2. relate the economic fundamentals with engineering practices
3. infer the macro-economic aspects of engineering projects

Syllabus: Teaching hours:

Unit I

Basic Economic Concepts: Needs, wants, means/resources – marginal principle and economic efficiency, trade - off, opportunity cost, rationality, externalities, differences between micro economics and macro economics — **3**

Unit II

Demand and Supply: Meaning and determinants of demand and supply, law of demand and law of supply equilibrium between demand and supply.. The concept of elasticity – meaning and types — **3**

Unit III

Production, Cost and Revenue: Production function, law of variable proportion and laws of returns to scale, different types of costs – variable cost, fixed cost, total cost, average cost, average fixed cost, average variable cost and marginal cost, Total revenue, average revenue and marginal revenue, profit function — **3**

Unit IV

Market Structures & Pricing: Concept of market and equilibrium- characteristics of perfect competition, monopoly, monopolistic competition and oligopoly–price determinations — **6**

Unit V

Macro-Economic Environment: Basic macro- economic concepts –aggregate demand aggregate supply, money, income employment consumption savings and investment. National Income Accounting-concepts and methods of national income
– recent changes in the methodology of national income accounting — **7**

Unit VI

Banking: Meaning and functions of commercial banks and central bank — **3**

Unit VII — **2**

Inflation: Meaning, and types of inflation, Causes and effect of inflation on different **s**ectors of the economy

Unit VIII — **3**

International Trade: Meaning and significance of International Trade, Cases for and against globalization. World Trade Organization (WTO) – functions and recent deliberations in World Trade Organization (WTO)

Self -Study:

The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings^:

1. Mankiw, N. G. Principles of Economics. Mason. Mason,USA: South-Western Cengage Learning.
2. Samuelson P. A. & Nordhaus, W.D. Economics. India: Tata McGraw Hill Education.
3. Pindyck, R.S., Rubinfeld, D. L. & Mehta, P. L. Micro Economics. New Delhi, India: Pearson.
4. Ahuja H.L. Modern Economics. New Delhi,India: S. Chand & Company Ltd.
5. Dornbusch, R., Fisher, S, & Startz, R. Macro Economics. India: Tata McGraw Hill Education.
4. Gupta, G. S. Macro Economics Theory and Applications. India:Tata McGraw Hill.

L =Lecture, T =Tutorial, P= Practical, C=Credit

^ this is not an exhaustive list

L	T	P	C
3	-	-	3

Course Code	2EC302
Course Name	Signals and Systems

Course Outcomes (COs):

After successful completion of the course, a student will be able to –

1. Classify the signals and evaluate properties of LTI systems
2. Analyze LTI systems in time domain and frequency domain
3. Demonstrate the use of state space model and its realization for LTI continuous and discrete time systems

Syllabus: **Teaching Hours:**

UNIT I: Introduction of Signals and Systems

Classification of Signals, Basic Operations on Signals, Elementary Signals, Overview of systems, Systems viewed as Interconnections of Operations, Properties of Systems — **07**

UNIT II: LTI System and Convolution

Time-Domain Representations for Linear Time- Invariant Systems: Convolution, Impulse Response Representation for LTI Systems, Properties of the Impulse Response, Differential and Difference Equation Representations for LTI Systems — **10**

UNIT III: Fourier Representation

Continuous and Discrete Time Fourier series and its properties, Continuous and Discrete Time Fourier Transform and its properties, examples and applications. — **18**

UNIT IV: Frequency Domain Analys is

Frequency response of LTI Systems, Fourier Transform Representations for Periodic Signals, Convolution and Modulation with Mixed Signal Classes, sampling theorem and its implications — **07**

UNIT V: State Space Representations

Block Diagram Representations, State- Variable Descriptions for LTI Systems, state transformation matrix — **03**

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings:

1. Simon Haykin, Signals and Systems, John Wiley
2. Mrinal Mandal and Amir Asif, Continuous and Discrete time signals and systems, Cambridge University Press
3. Oppenheim & Wilsky, Signals & Systems, PHI
4. M. J. Roberts, Signals and Systems TMH India
5. Tarun Ravat, Signals and systems Oxford Univ. Press

L = Lecture, T = Tutorial, P = Practical, C = Credit

EC402 Electronics Devices and Circuits - II [3 0 2 4]

Course Learning Outcome:

After successful completion of this course, students will be able to

1. Apply the concepts of advance electronics devices
2. Understand the operation of FET and MOSFET in order to build circuits
3. Analyze different configuration of feedback amplifiers
4. Apply ac and dc analysis of amplifier for a different frequency response
5. Design, fabricate and test small electronics circuits

Syllabus:

Feedback Amplifier: Feedback concept, transfer gain with feedback, general characteristics of negativefeedback amplifiers, input resistance, output resistances, method of analysis of a feedback amplifier,

Current-shunt feedback, voltage-shunt feedback, current-series feedback, voltage-series feedback

Oscillators: Sinusoidal oscillator, Phase shift oscillators, Resonant-circuit, General Form of oscillators, Wien bridge oscillators, Crystals oscillator

Power Amplifier: Class a, second harmonics distortion; higher order harmonics generation, transformer-

coupled audio power amplifiers, efficiency, and Push-Pull amplifier, Class B, Class AB

Power Supply: Regulated power supply – series voltage regulator design, Short circuit and overload protections, Voltage regulator ICs. -Linear & SMPS

Tuned Amplifier: Basic principle, Single tuned, double tuned and staggers tuned amplifiers

Field Effect Transistor: Construction of JFET, operation of JFET, JFET characteristics, pinch-off voltage, JFET volt-ampere characteristics, FET small signal, MOSFET, FET as a VVR FET biasing, Fixed bias circuit,

Voltage divider biasing circuit, self bias circuit, biasing for depletion type MOSFET, JFET as an amplifier,

JFET low frequency small signal model, Common source circuit, Common drain circuit

MOSFET: Fundamental of MOS Diode, MOSFET, Effect of Gate & Drain voltage on Mobility, Channel

Length Modulations, MOSFET Break drown & Punch –Through, Sub threshold Current, MOSFET Scaling, Nonuniform Doping in the Channel, Threshold voltage of Short-channel MOSFETs, Small Signal Analysis, SOI MOSFET, Buried Channel MOSFET.

Basic MOS Device Physics: General Considerations, MOS I/V Characteristics, Second order effects, MOS Device Models.

Single Stage Amplifier:Basic Concepts, Common –Source Stage, Source Follower, Common Gate Stage, Cascode Stage, Choice of device models.

CMOS Processing Technology:Wafer Processing, Photolithography, Oxidation, Ion Implantation, Deposition and Etching, Device Fabrication, Interconnects, Latch-ups.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Millman & Halkias, Integrated Electronics, McGraw Hill
2. Behzad Razavi, Design of Analog CMOS Integrated Circuits, McGraw Hill

L	T	P	C
3	-	2	4

Course Code	2EC403
Course Title	Communication Systems

Course Outcomes (COs):

At the end of the course, students will be able to -

1. Comprehend probability & stochastic theories as applied to signals and noise
2. Analyze analog modulation techniques and receiver fundamentals used in analog communication
3. Apply baseband digital encoding & decoding techniques in the storage / transmission of digital signal through wired channel
4. Apply techniques like matched filter, pulse shaping, line encoding and equalizer to mitigate the adverse effects of noise and dispersion

Syllabus: **Teaching Hours:**

UNIT I: Random Processes

Review of Fourier Transform and its properties, Mathematical Definition of a Random Process, Stationary Processes, Mean, Correlation, and Covariance Functions, Ergodic Processes, Transmission of a Random Process Through a Linear Time Invariant Filter, Power Spectral Density and Autocorrelation function, Gaussian Process, Noise, Stochastic Analysis of Noise. **07**

UNIT II: Continuous Wave Modulation

Amplitude Modulation, Linear Modulation Schemes, Frequency Translation, Frequency-Division Multiplexing, Angle Modulation, Frequency Modulation, Nonlinear Effects in FM systems, Superheterodyne Receiver, Noise in AM, FM and PM Modulation Systems, Noise in FM Receivers. **10**

UNIT III: Pulse Modulation

Sampling Process, Pulse-Amplitude Modulation, Other forms of Pulse Modulation, Bandwidth – Noise Trade-off, Quantization Process, Pulse-Code Modulation, Noise Considerations in PCM Systems, Time-Division Multiplexing, Digital Multiplexers, Virtues, Limitations and Modifications of PCM, Delta Modulation, Adaptive Delta Modulation, Linear Prediction, Differential Pulse-Code Modulation, Adaptive Differential Pulse-Code Modulation, Sigma-Delta Modulation **18**

UNIT IV: Baseband Pulse Transmission

Matched Filter, Error Rate Due to Noise, Intersymbol Interference, Nyquist's Criterion for Distortionless Baseband Binary Transmission, Correlative-Level Coding, Baseband M-ary PAM Transmission, Digital Subscriber Lines, Optimum Linear Receiver, Adaptive Equalization. **10**

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

1. Simon Haykin, Communication Systems, John Wiley
2. B P Lathi, Modern Analog and Digital Communication Systems, Oxford
3. Roddy and Coolen, Electronic Communication, PHI

4. Taub and Schilling, Principles of Communication Systems, Tata McGraw Hill
5. M F Mesiya, Contemporary Communication Systems, McGraw Hill

EC404 Electronics Design, Tools and Packages [0 0 2 1]

Course Learning Outcome:

After successful completion of this course, students will be able to

1. Understand active and passive components with their identification and testing using various measurement instruments
2. Design of Printed Circuit board and simulate basic electronics circuits
3. Apply electronics principle for analog and digital circuit design
4. Analyze electronics circuits using latest Electronics Design Automation tools for given specifications

Syllabus:

Basics of Measurement Instruments, Understanding of active and passive electronic components, PCB Making tools, Design of basic electronics circuits, Study of circuit design and simulation tool, PCB layout design tool, Design of a hardware project consist of all covered topic.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

EC405 Seminar [0 0 1 1]

Course Learning Outcome:

After successful completion of this course, students will be able to

1. Carry out intense study on a specific topic related to current development in their field of specialization
2. Collect, interpret and analyze the information
3. Compare and evaluate the existing solutions for a specific cases study
4. Develop skills of presentation and report writing
5. Develop a skill to work in a team

Syllabus:

Students are required to select an advanced topic relevant to field of study. Student should submit report based on his study and is required to make presentation for evaluation.

L	T	P	C
3	-	-	3

Course Code	2EC401
Course Title	Electromagnetics and Wave Propagation

Course Outcomes (COs):

At the end of the course, students will be able to –

1. Apply vector calculus to understand the behavior of static electric, magnetic and electromagnetic fields in standard configurations
2. Develop the electronic systems using fundamental principles and laws of electromagnetism
3. Comprehend the four basic Maxwell's equations for wave propagation and apply them to different EM problems

Syllabus: **Teaching Hours:**

UNIT I: Vector Analysis **02**

Scalars & Vectors, dot and cross products, co-ordinate systems and conversions

UNIT II: Electrostatic

electrostatic field, Coulomb's law, field due to different charge distributions. electric flux density, Gauss's law, Maxwell's first equation and divergence theorem, definition of potential difference and potential, potential field of a point charge and system of charges, potential gradient, definition of currents and current density, continuity equation, semiconductors and dielectric materials, boundary conditions, capacitance of a parallel plate capacitor **07**

UNIT III: Magnetostatics

Magnetostatics fields, Biot-Savart's law, Ampere's circuital law, concept of flux density, scalar and vector magnetic potential, magnetic forces, force on a moving charge, force on a differential current element, force and torque on a close circuit, magnetic boundary conditions **07**

UNIT IV: Time Varying Field and Maxwell's Equations **04**

Faraday's law, displacement current, Maxwell's equations in point and integral forms

UNIT V: The Uniform Plane Waves

Uniform plane wave, Solution of plane wave, wave polarization, wave propagation in conducting medium, phase and group velocity, power flow and Poynting vector, surface current and power loss in a conductor **04**

UNIT VI: Transmission Lines

Equations of voltage and current on T_X line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance transformation on loss-less and low loss transmission line, power transfer on T_X line, smith chart, applications of transmission lines: impedance matching, use transmission line sections as circuit elements (Single Stub matching). **10**

UNIT VII: Wave propagation in parallel plane waveguide

Analysis of waveguide general approach, rectangular waveguide, modal propagation in rectangular waveguide, field visualization, attenuation in waveguide **06**

UNIT VIII: Radiation

Solution for potential function, radiation from the Hertz dipole, power radiated by hertz dipole, radiation parameters of antenna, receiving antenna, monopole and dipole antenna, **05**

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Suggested Readings :

1. Matthew N. O. Sadiku, Principle of Electromagnetics, Oxford International
2. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India

3. William Hayt, J A Buck, Engineering Electromagnetic, MGH
4. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
5. Narayana Rao, N: Engineering Electromagnetics, Prentice Hall

L	T	P	C
3	-	2	4

Course Code	2EC402
Course Title	Analog Circuits

Course Outcomes (COs):

At the end of the course, students will be able to

1. Comprehend the fundamentals of op-amp and its basic amplifier configurations
2. Analyse the linear and non-linear applications of operational amplifier
3. Design and Construct various circuits using operational amplifier based ICs

Syllabus: **Teaching Ho urs:**

UNIT I: Operational Amplifier and its characteristics

Differential Amplifier, Block Diagram Representation of op-amp, Ideal op-amp., Equivalent Circuit, op-amp with Negative Feedback, Datasheets — **06**

UNIT II: Practical op-amp and Various Parameters

Measurement of Input Offset Voltage, Input Offset Current, Input Bias Current, Differential Input Resistance, Output resistance, Input Capacitance, Offset Voltage Adjustment Range, Input Voltage Range, Output Offset Voltage Swing, CMRR, Slew rate, PSRR, Gain Bandwidth Products, Transient Response, Power Consumption — **04**

UNIT III: Linear Applications

AC/DC Amplifier, Inverting and Non-Inverting Amplifier, AC Amplifiers with single supply voltage, The Peaking Amplifier, Summing, Scaling and Averaging Amplifier, Instrumentation Amplifier, Differential input and Differential output amplifier, Integrator, Differentiator, Voltage to Current Converter with floating and grounded load, Current to Voltage Converter, Voltage Follower. — **06**

UNIT IV: Non Linear Applications

Comparator, Zero Crossing Detector, Schmitt Trigger, Voltage Limiters, Clipper and Clampers, Absolute Value output circuit, Peak Detector, Sample and Hold Circuit, Precision Rectifier – Half/Full Wave, Square, Log/ Antilog Amplifier. — **06**

UNIT V: Active Filters

Classification of filters, Magnitude and frequency Scaling, Magnitude and attenuation characteristics of ideal and practical filters, design Parameter Q & ω_0, Biquad (Universal) filter design, Butter worth Low pass and High pass filters-1st and 2nd order circuits design, Butterworth pole location, Sallen & Key circuit, Butterworth Bandpass Filters, Band reject filters. — **05**

UNIT VI: Oscillators

Oscillator Principles, Types of Oscillator, Phase shift oscillator, Wein Bridge oscillator, Square wave oscillator, Triangular wave and Saw tooth Generator. — **06**

UNIT VII: A/D and D/A Converters

Data converter operations, principle and applications, Classification of Analog to Digital and Digital to Analog converter, Data converter ICs. — **06**

UNIT VIII: Specialized ICs and Applications

555 Timer, Phase Locked Loop and Voltage Regulator ICs — **06**

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings :

5. Ramakant A. Gayakwad, op-amp and Linear Integrated Circuits, Prentice Hall India
6. Van Valkenburg, Analog filter design, Oxford Publication
7. Sergio Franco, Design with operational amplifier and analog ICs, Tata Magraw hill
8. J. Michael Jacob, Application and design with analog Ics, Prentice Hall India
9. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill.

L	T	P	C
3	-	2	4

Course Code	2EC404
Course Title	Microprocessors and Microcontrollers

Course Outcomes (CO):

At the end of the course, students will be able to –

1. Comprehend the architecture and instruction set of 8086 microprocessor and 8051 microcontroller
2. Demonstrate assembly language programming proficiency
3. Develop interface logic for interconnection of peripheral devices with microprocessor and microcontroller

Syllabus: **Teaching Hours:**

UNIT I: Architecture of Microprocessor **08**

Introduction, Overview and Classification of Microprocessors, Overview of 8086 microprocessor, Architecture of 8086 and its operating modes, Signals and pins of 8086 microprocessor, Interrupts

UNIT II: Assembly Language of 8086 **06**

Instruction set of 8086. Addressing modes. Assembly directives. Assembly Language Programming Tools

UNIT III: Interfacing with 8086 **06**

Memory Interfacing, timing diagrams, Interfacing with peripheral ICs like 8255, 8279, 8259

UNIT IV: Architecture of Micro controller **08**

Architecture of 8051 microcontroller. Signals and pins of 8051 microcontroller, Interrupts

UNIT V: Assembly Language of 8051 **08**

Instruction set of 8051. Addressing modes. Assembly directives.

UNIT VI: Interfacing with 8051 **06**

Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs, Interfacing with DACs, Sensor Interfacing

UNIT VII: Overview of ATMEGA Microcontrollers **03**

Arduino

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

Douglas V. Hall, Microprocessors and Interfacing: Programming and Hardware, TMH

Kenneth Ayala, The 8051 Microcontroller, Cengage

M. A. Mazidi, J. C. Mazidi and R.D.Mckinlay, The 8051 Microcontroller and Embedded System, Pearson

K. M. Burchandi and A. K. Ray, Advanced Microprocessors and peripherals, TMH

Margolish, Michale, Arduino cook book, Shroff publisher

EE421 Electrical Machines and Drives [3 0 2 4]

Course Learning Outcome:

After successful completion of this course, students will be able to

1. understand the working of various electrical machines and their conventional control
2. understand the power electronic devices and their application in electrical drives

Syllabus:

DC Motors: Principle of operation, torque equation, losses and efficiency, speed torque characteristics of shunt, series and compound motors, speed control of DC shunt and series motors, DC shunt motors starter, applications

Transformers: Principle of operation, EMF equation, voltage ratio and turn ratio, construction of single phase transformer, phasor diagram of transformer on no load and on load, exact and approximate equivalent circuit of transformer, voltage regulation, loses and efficiency of transformer, condition of maximum efficiency, auto transformer, parallel operation of transformers, concept of three phase transformer

Three Phase Induction Motors: Construction, production of rotating field, principle of operation, speed and slip, rotor current, relation between rotor copper loss and rotor input, torque of an induction motor, condition of maximum torque, torque slip curve, losses and efficiency, starters for three-phase induction motor, speed control of induction motor

Single Phase Induction Motors: Production of magnetic field in single phase motor, various methods of starting of single-phase induction, characteristics, applications, universal motors

Power Semiconductor Devices: Basic structure and operation of SCR, static and dynamic switching characteristics of SCR, basic structure and operation of MOSFET, general switching characteristics of MOSFET, Basic structure and operation of IGBT, static and dynamic switching characteristics of IGBT

Power Converters: Single phase controlled rectifier, three-phase controlled rectifier, filtering systems in rectifiers, dc choppers, step down dc converter, step up dc converter, single phase voltage source inverter, three phase voltage source inverter, various PWM techniques.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. E E. Fitzgerald, Electric Machinery, TMH Publications
2. B. L. Theraja, Electrical Technology Vol. III, S. Chand & Company
3. M G Say, Performance & Design of Alternating Current Machines, CBS publishers
4. M. H. Rashid, Power Electronics Circuits Devices & Application, Pearson Education.
5. M. S. Jamil Asghar, Power Electronics, Prentice Hall of India.

MA401 Probability Distributions and Numerical Methods [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. Understand basic principles of Probability, sample space, conditional probability
2. Know basic discrete & continuous distributions & how to work with to them
3. Understand cumulative distribution function, expectation and distributions for functions of random variables
4. Work with bivariate distributions & basic two variable statistics
5. Know random processes and their applications
6. Know iterative methods to solve algebraic and transcendental equations
7. Know methods to solve simultaneous linear equations
8. Know methods of numerical solutions of ordinary differential equations of first order

Syllabus:

Probability and random variables: Overview of probability, types of probability, axioms of probability, concept of random variable, density and distribution functions, conditional distributions.

Function of random variables: The random variable g(X), the distribution of g(X), mean and variance, moments, characteristic functions, bivariate distribution, one function of two random variables, two functions of two random variables, joint moments, conditional distribution, and conditional expected values.

Random processes: definitions and classification of random processes, stationary and ergodic processes, discrete and continuous processes, Markov chain.

Iterative methods: Solution of algebraic and transcendental equation by bisection, Newton-Raphson method, successive approximation method.

Solution of simultaneous linear equations: Direct method, Gauss eliminational method, Gauss-Jordan method Iterative method, Gauss-Jacobi method, Gauss-Seidal method.

Numerical solution of ordinary differential equations: Taylor series method, Euler's method, Ruge-Kutta methods.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. A. Papoulis and S. UnnikrishnaPillai, Probability, Random variables and Random Processes, Tata McGraw Hill.
2. S. C. Chapra and R P Canale, Numerical methods for Engineers with Programming and software applications, Tata McGraw Hill
3. B.S.Grewal, Numerical methods, Khanna Publication, New Delhi.

L	T	P	C
2	0	0	2

Course Code	2HS341
Course Title	Principles of Management

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. interpret the various theories and processes of management
2. relate with different functional areas of management
3. appreciate the role and need of managers in different organisations

Syllabus: Teaching hours:

UnitI **8**

Nature of Management: Concept, Significance, Role & Skills, Levels of Management, Concepts of POSDCORB (Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting). Overview of Decision making. Evolution of Management thoughts, Contribution of F.W Taylor, Henri Fayol and Contingency Approach. Overview of Indian thoughts on Management, Management by Objectives (MBO)

UnitII **4**

Planning: Meaning, Importance, Elements, Process

UnitIII **6**

Organizing: Concepts, Structure (Formal & Informal, Line & Staff and Matrix), Meaning, Advantages and Limitations of organizing. Departmentation: Meaning, Basis and Significance, Span of Control: Meaning, Factors affecting span of Control, Centralization vs. Decentralization, Delegation: Authority & Responsibility relationship

UnitIV **6**

Directing, Co-ordination and Controlling: Leading : Concept of leadership, Directing: Meaning and Process, Co-ordination as an Essence of Management, Controlling: Meaning, Process and Technique

UnitV **6**

Functional Management: Introduction to different functional aspects of management- Finance, Operations, Marketing, Human Resource and Strategic Management

Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents

Suggested Readings^:

1. Koontz & Weihrich , Essentials of Management; Tata McGraw Hill
2. Tripathy & Reddy , Principles of Management; Tata McGraw Hill
3. Kreitner & Mohapatra, Management ; Biztantra
4. Robbins , Decenzo & Coulter, Fundamentals of Management; Pearson Education
5. Stoner, Freeman & Daniel R Gilbert, Management; Pearson Education
6. Robbins & Coulter, Management; Prentice Hall (India) Pvt. Ltd

L = Lecture, T = Tutorial, P = Practical, C = Credit

^ this is not an exhaustive list

L	T	P	C
3	0	0	3

Course Code	EC501
Course Title	Electromagnetics Engineering

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. apply vector calculus to understand the behavior of static electric, magnetic and electromagnetic fields in standard configurations
2. understand the fundamental principles and laws of electromagnetism to develop and implement better analog and digital electronic system that take into account electromagnetic propagation and radiation effects
3. understand the four basic Maxwell's equations and be able to apply them to different EM problems
4. describe and analyze electromagnetic wave propagation in different mediums including free-space
5. apply the basic knowledge of electricity and magnetism in various courses of higher semester, e. g. Antenna Theory, Microwave Engineering, Fiber Optic Communication, etc

Syllabus:

Vector Analysis: Scalars & Vectors, dot and cross products, co-ordinate systems and conversions

Coulomb's Law and Electrical Field Intensity: Coulomb's law, field due to different charge distributions. Electric flux density, Gauss's law and divergence: Concept of electric flux density, Gauss's law and its applications, differential volume element, divergence, Maxwell's first equation and divergence theorem

Energy and Potential: Energy expanded in moving a point charge in electrical field, line integral, definition of potential difference and potential, potential field of a point charge and system of charges, potential gradient, dipole, energy density in electrostatic field

Conductors, Dielectrics and Capacitance: Definition of currents and current density, continuity equation, metallic conductors and their properties, semiconductors, dielectric materials, characteristics, boundary conditions, capacitance of a parallel plate capacitor

Poisson's and Laplace Equation: Poisson's and Laplace equation, Uniqueness theorem, examples of solution of Laplace and Poisson's equations

Steady Magnetic Field: Biot-Savart's law, Ampere's circuital law, concept of flux density, scalar and vector magnetic potential. Magnetic forces, materials and inductance: Force on a moving charge, force on a differential current element, force and torque on a close circuit, magnetization and permeability, magnetic boundary conditions

Time Varying Field and Maxwell's Equations: Faraday's law, displacement current, Maxwell's equations. in point and integral forms

The Uniform Plane Waves: Wave motion in free space, perfect dielectric, dielectric, pointing vector, power consideration, propagation in good conductor, phenomena of skin effect, reflection of uniform plane waves, Standing Wave Ratio

Self Study: The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. William Hayt, J A Buck, Engineering Electromagnetic, MGH
2. Matthew N. O. Sadiku, Principle of Electromagnetics, Oxford International
3. John Kraus, Daniel Fleisch, Electromagnetics with Applications, MGH
4. Bhag Guru, Huseyin Hiriroglu, Electromagnetic Field Theory Fundamentals, Cambridge
5. John Reitz, Fredrick Milford, Foundation of Electromagnetic Theory, Pearson

L	T	P	C
3	0	2	4

Course Code	**EC502**
Course Title	**Integrated Circuits and Applications**

Course Learning Outcomes:

After successful completion of the course, the students will be able to

1. learn the fundamentals of op-amp and its basic amplifier configurations
2. learn the practical op-amp parameters and later to use those to modify practical op-amp amplifier configurations
3. analyze and design the op-amp for linear and non-linear application
4. analyze and design the op-amp for filter application
5. learn and analyze op-amp based ICs and its applications to construct the basic blocks of Analog signal processing

Syllabus:

Operational Amplifier and its Characteristics: Differential Amplifier based on MOS design, Block Diagram Representation of op-amp., Schematic Symbol, Dual Power Supply for op-amp., Ideal op-amp., Equivalent Circuit, Integrated Circuits, op-amp with Negative Feedback

Practical Op-amp and Various Parameters: Measurement of Input Offset Voltage, Input Offset Current, Input Bias Current, Differential Input Resistance, Output resistance, Input Capacitance, Offset Voltage Adjustment Range, Input Voltage Range, Output Offset Voltage Swing, CMRR, Slew rate, PSRR, Gain Bandwidth Products, Transient Response, Power Consumption

Applications of Operational Amplifier:

Linear Applications: AC/DC Amplifier, Inverting and Non-Inverting Amplifier, AC Amplifiers with single supply voltage, The Peaking Amplifier, Summing, Scaling and Averaging Amplifier, Instrumentation Amplifier, Differential input and Differential output amplifier, Integrator, Differentiator, Voltage to Current Converter with floating and grounded load, Current to Voltage Converter, Voltage Follower

Non Linear Applications:-Comparator, Zero Crossing Detector, Schmitt Trigger, Voltage Limiters, Clipper and Clampers, Absolute Value output circuit, Peak Detector, Sample and Hold Circuit, Precision Rectifier – Half/Full Wave, Square, Triangular and Saw tooth Wave Generator, Log/ Antilog Amplifier

Active Filters: Classification of filters, Magnitude and frequency Scaling, Magnitude and attenuation characteristics of ideal and practical filters., design Parameter Q & ω_0, Biquad (Universal) filter design, Butter worth Low pass and Highpass filters-1st and 2nd order circuits design, Butterworth pole location, Sallen & Key circuit, Butterworth Bandpass Filters-Frequency Transformation, Deliyannis- Friend circuit, Chebyshev filter characteristics, Band reject filters

Specialized ICs:

555 Timer and its Applications: Block Diagram, Monostable and Astable Multivibrator, Applications as Frequency Divider, Square Wave Generator, Free Running Ramp Generator etc.

Universal Active Filter: Active filter design using IC of Universal active filter

Phase Locked Loop and its Applications: Block Diagram and Operation, Applications as Frequency Multiplier, Frequency Shift Keying

Design of Power Supply: Simple op-amp Voltage regulator, three terminal Voltage Regulators, Fixed and Adjustable Voltage Regulators, Heat Sink, Dual Power supply, Basic Switching Regulator and its characteristics, IC based SMPS, concept of Point of Loading (POL)

Power Amplifiers

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Ramakant A. Gayakwad, op-amp and Linear Integrated Circuits, Prentice Hall India
2. Behnad Razavi, Design of Analog CMOS integrated circuits, Tata Magraw hill
3. Van Valkenburg, Analog filter design, Oxford Publication
4. Sergio Franco, Design with operational amplifier and analog ICs, Tata Magraw hill
5. Robert F. Coughlin, Frederick F. Driscoll, Operational Amplifier and Linear ICs, Prentice Hall India

EC503 Microprocessor and Computer Architecture [3 0 0 3]

Course Learning outcomes:
After successful completion of the course, the students will be able to

1. understand the basic architecture and operation of 8086 Microprocessor
2. apply the basic knowledge of processor and memory to evaluate overall performance of computer
3. analyze the architectural and operational behaviour of hypothetical reduced instruction set Computing (RISC) processor
4. apply the concept of cache memory, virtual memory and address translation between different memories to understand the hierarchical memory organization and peripheral interfacing

Syllabus:
Organization of a Computer & Instruction Set Architecture: Von Neumann and Harvard architecture, RISC and CISC Processors
8086 Processor: Architecture, Memory segmentation, Interrupt system, Pin diagram, Instruction set, Addressing modes, Timing diagram.
Computer Performance: Cost and Performance, Performance enhancement, Amdhal's law, Performance estimation.
Instruction Set Architecture of MIPS Processor: Instructions format, Addressing modes, Procedure and Data, Assembly language programming, Instruction set variation
Design of ALU: Adders and simple ALU, Multiplier and Divider.
Data Path and Control Path of MIPS Processor: Instruction execution steps, single cycle and Multi cycle data path, Performance of single and multi-cycle data path,Control unit synthesis, Micro programming, Pipe-lined data path, pipeline performance limits, Data dependencies and Hazards.
Memory Organization: Memory hierarchy, SRAM, DRAM, Cache organization, Cache mapping schemes, Improving cache performance, Virtual Memory, Adderess translation, Translation look aside buffer
Buses, Links and Interfacing: Intra and Inter system links, Bus Communication Protocols, Interfacing standards

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Douglas Hall, Microprocessor and Interfacing, TMH
2. Behrooz Parahami, Computer Architecture from Microprocessor to Super Computer, Oxford
3. J. Hayes, Computer Architecture and Organization, TMH
4. Govind Rajalu, Computer Architecture, TMH
5. D. Patterson and J. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufman

EC504 Modern Measurement and Instrumentation [2 0 0 2]

Course Learning Outcomes:

After successful completion of the course, the students will be able to

1. understand the measurement errors in instruments
2. analyze various ac and dc bridges and study their applications
3. understand the fundamental operation of various measuring instruments
4. understand the construction and principle operation of various transducers and sensors
5. learn the recent developments in measurement

Syllabus:

Fundamentals of Measurements and Instruments: Static and Dynamic Characteristics, Measurement errors, Accuracy and precision, analog waveform generators

Bridge Measurements: Wheatstone bridge, Kelvin bridge, AC bridge and their applications, Maxwell bridge, Hay's bridge, unbalance conditions, Wein bridge, Anderson's bridge, De Sautys bridge, Schering bridge

Oscilloscopes: Introduction, oscilloscope block diagram, Cathode Ray Tube, CRT circuits, Vertical deflection system, delay line, multiple trace, Horizontal deflection system, Digital Storage Oscilloscope, MSO, Power analyzer

Signal Analyzers: Wave analyzer, Spectrum analyzer, Real Time analyzer, Logic analyzer, Distortion analyzer, Digital FFT analyzer, various types of Network analyzers

Transducers and Sensors: selection consideration, resistive strain guage, Temperature transducers, platinum type, thermistor, inductive, LVDT, capacitive, Load cell, Piezoelectric, hall effect sensor, Photoelectric transducer, Fiber optic sensors, smart sensors, micro-sensors

Computer Aided Measurements: Computer based DAS, Analysis and interface

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Albert D. Helfrick and William D. Cooper, Modern electronics Instrumentation and Measurement Techniques, PHI
2. A.K.Sawhney, A course in Electrical and electronics measurement and Instrumentation, Dhanpatrai & Sons
3. Kalsi, Electrical and Electronic Measurement and Instrument, TMH
4. Oliver, Electronic measurements and instrumentation, TMH

EC505 Digital Communication [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand the process of converting the baseband signal into a passband signal using digital modulation techniques
2. understand the spread spectrum modulation principles
3. understand various performance parameters of practical communication systems like satellite and mobile communication
4. understand the principles of information theory and error control coding
5. analyze and evaluate the actual digital communication system

Syllabus:

Passband Digital Transmission: Passband transmission model, Coherent phase shift keying, Hybrid Amplitude / Phase Modulation schemes, Coherent frequency shift keying, Detection of signals with unknown phase, Noncoherent Binary Frequency shift keying, Differential phase-shift Keying, Comparison of Digital Modulation Schemes, Multichannel modulation and OFDM, Synchronization, Carrier recovery and symbol timing

Spread-Spectrum Modulation: Pseudo-Noise Sequences, A Notion of spread Spectrum, Direct-Sequence Spread Spectrum with Coherent Binary Phase-shift Keying, Signal-Space Dimensionality and processing Gain, Probability of Error, Frequency Hop Spread Spectrum

Multiuser Radio Communications : Multiple-Access Techniques, Satellite Communications, Radio Link Analysis, Wireless Communications, Statistical Characterization of Multipath Channels, Types of fading channels, TDMA & CDMA Wireless Communication System, Source Coding of Speech for Wireless Communication, Adaptive Antenna Arrays for Wireless Communication, Equalizer

Information Theory : Uncertainty, Information and Entropy, Source Coding Theorem, Data Compression, Channel Capacity, Channel Coding Theorem, Channel Capacity of various channel, Shannon's vision of Error-free communication

Error-Control Coding: Linear Block Codes, Cyclic Codes, Convolutional Codes, Maximum Likelihood Decoding of Convolutional Codes, Trellis-Coded Modulation, Turbo codes, Channel coding trade offs

Case Study of a Typical Digital Communication System: Analysis and design of a practical digital communication system in the fields of mobile, wireless and/or satellite communication

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Simon Haykin, Communication Systems, Wiley
2. B. P. Lathi, Modern Digital and Analog Communications Systems, Oxford
3. Bernard Sklar, Digital Communication Fundamentals and Applications, Pearson
4. John Proakis, Digital Communications, McGrawHill

EC506 Digital Signal Processing [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand the process of converting the continuous-time signal into digital signal, process it and convert back to continuous-time signal
2. apply the tools like DFT and z-transform to analyze and design the digital LTI systems
3. apply the digital filter structures and DSP processor knowledge to implement the actual digital LTI systems and evaluate the effect of finite word-length effects
4. understand the multirate DSP fundamentals
5. evaluate various applications of DSP techniques in the fields of signal processing and communications

Syllabus:

Digital Processing of Continuous-time Signals: Sampling of baseband and bandpass signals, Anti-aliazing filter, sample-and-hold circuit, Types of ADCs and DACs, Reconstruction filter

Discrete Fourier Transform (DFT): Definition and properties / theorems, DFT symmetry relations, Circular shifting and circular convolution in DFT, Linear convolution using DFT, Applications of DFT, FFT algorithm

z-Transform: Definition and properties, ROC, The inverse-z transform, the transfer function

LTI Discrete-time Systems in the Transform Domain: Effect of pole and zero of rational z-transform on overall response, simple digital filters (LPF, HPF, BPF, Notch), Linear Phase digital filters, Complementary transfer functions, Inverse Systems, System identification

Digital Filter Structures: Basic FIR and IIR filter structures, Lattice structure, Polyphase structure, Analysis of finite word-length effect in filter structure design

IIR and FIR Digital Filter Design: IIR filter design using Bilinear transformation, Analogue filter responses like Butterworth, Chebychev, Elliptic and Bessel, FIR filter design using Windows and Gibbs phenomenon, computationally efficient FIR filter design, Parks-McClellan algorithm

Multirate DSP Fundamentals and Filter Banks: Decimation and interpolation definition and frequency-domain effects, noble identities, multistage design, fractional rate conversion, computationally efficient filters using polyphase decomposition, Digital Filter Banks, Uniform DFT filter banks, Quadrature mirror filter banks, Nyquist filters, Applications of multirate DSP, Wavelet and other transforms

Applications of DSP: Applications in spectral analysis, digital audio/music, signal compression, ADC/DAC and communication systems

DSP Processor Architecture: Basics of a DSP processor architecture

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Sanjit K. Mitra, Digital Signal Processing, A computer-based Approach, TMH
2. Oppenheim, Schafer and Buck, Discrete-time Signal Processing, Pearson
3. Proakis and Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, Pearson
4. Steven W. Smith, The Scientist and Engineer's Guide to Digital Signal Processing, California Technical Publishing

EC507 Microprocessor and Microcontroller Lab [0 0 2 1]

Course Learning Outcome:
After successful completion of the course, the students will be able to

1. understand basic architecture of Microprocessor and Microcontroller
2. write programs and interface different peripherals
3. develop hardware module for specific application

Syllabus:
8086 Microprocessor: Lab includes basic assembly language programming based on the 8086 Microprocessor instruction set
8051 Microcontroller: Lab includes the study of 8 bit/16 bit microcontroller. Micro controller hardware for
doing exercises in assembly and C programming and hardware interfacing. Laboratory assignments typically address hardware issues such as parallel and serial ports, interrupts, and timers. Some assignments deal with controlling attached devices, such as stepper motors, LED and LCD displays etc.

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. K. J. Ayla, The 8051 Micro controller – Architecture Programming & Application, Penram International Publications
2. Mohammad Ali Mazidi & Janice Gillispie Mazidi, 8051 Micro controller and Embedded System, Pearson Education Publications
3. Douglas Hall, Microprocessors & Interfacing, TMH
4. Peter Abel, IBM PC Assembly Language and Programming, Prentice Hall

EC508 Mini Project-I [0 0 2 1]

Course Learning Outcome:

After successful completion of the course, students will be able to

1. practice acquired knowledge within the chosen area of technology for project development
2. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. reproduce, improve and refine technical aspects for engineering projects
4. work as an individual or in a team in development of technical projects
5. communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:
product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

SS561 Creativity and Innovation
[2 0 0 2]

Course Learning Outcome:

By the end of this course students will be able to:

1. Understand the importance of R directed thinking complementing L directed thinking
2. Infer and discover processes and methods of creative problem solving
3. Enhance and correlate their creative and innovative thinking skills
4. Understand various disruptive innovations and techniques
5. Analyze and apply various tools of creativity to some basic problems

Syllabus:

1. INTRODUCTION:

1. Introduction to Creativity and Innovation
2. Creativity V/s. Innovation
3. Creativity as thinking skill
4. Critical Thinking V/s. Creative Thinking
5. Lateral Thinking
6. Engineering and Creativity
7. Creativity in Problem Solving

2. TOOLS FOR CREATIVITY:

1. Brain storming
2. Mind mapping
3. SWOC Analysis
4. Fishbone diagram
5. Six thinking hats
6. Borrowing brilliance
7. Da Vinci's seven principles
8. Provocation and movement
9. Examples and case studies

3. WHOLE NEW BRAIN

6. L directed thinking V/s. R directed thinking
7. From agriculture age to Industrial age to Information age to Conceptual Age
8. Need to high touch – design, story symphony, empathy, play, meaning

4. SKILLS FOR DISRUPTIVE INNOVATORS

1. Introduction
2. Associating
3. Questioning
4. Observing
5. Networking
6. Experimenting
7. Putting skills into practice
8. Case studies

5. MEDICI EFFECT

1. Introduction
2. Intersection
3. Creating medici effect
4. Making intersectional ideas happen
5. Case studies

6. TRIZ INNOVATION

1. Introduction
2. Ideality
3. Resources
4. Contradictions
5. Pattern of innnovation
6. Case studies

7. BIO MIMICRY

1. Introduction
2. Design of various products inspired by nature like Green building, bullet train, Nike Clothing, Velcro, Adhesive Tape, Turbine, self-heating plastic, friction reducing swimming suit, automated robot, screen display, deep blue

8. JUGAAD INNOVATION:

1. Introduction
2. Jugaad tactics: Seek Opportunities in Adversity, Do more with less, Think and act Flexibly, Keep it simple, Include the margin, Follow your heart.
3. Case studies

9. CASE STUDY BY IDEO DESIGN THINKING MODEL

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

References:

1. Daniel H. Pink, A whole new mind, Pearson publication, New Delhi
2. Benyus, J.M.1997. Biomimicry:Innovation Inspired by Nature, HarperCollins,New York
3. Technical Innovation Center Inc, USA Altshuller G (1997) 40 Principles. TRIZ Keys to Technical Innovation. Technical Innovation Center Inc, USA Andrews P
4. Kelly, Tom (2001): The Art of Innovation, Lessons in Creativity from IDEO, America's Leading Design Firm, Doubleday, NY
5. Tina Seelig, Ingenius, A Crash course on Creativity Hayhouse, U.K
6. Edward de Bono, Lateral Thinking, Be more creative and productive, Penguin India
7. Edward de Bono, Teach Yourself to Think, Penguin India
8. Edward de Bono, Six Thinking Hats, Little Brown and Company
9. Jonah Lehrer, Imagine, How creativity works, Canongate, Edinburgh, London
10. John Adair, The Art of Creative Thinking, Kogan Page India, New Delhi
11. Jeff Dyer, Hall Gregersen & Clayton M. Christensen, The Innovator's DNA, Harvard Business Publishing
12. Daniel Goleman, Emotional Intelligence, Bloomsbury Publishing India P.Ltd.]
13. Howard Gardner, Five Minds for the Future, Harvard Business Review Press
14. Malcolm Gladwell, Blink: The Power of Thinking Without Thinking, Hachette Book Group USA
15. Navi Radjou, Jaideep Prabhu, Simone Ahuja, Jugaad Innovation, Wiley Publisher

Website References:

1. Ideo.com
2. Asknature.org
3. Edwdebono.com
4. Triz40.com

SS562 Law for Engineers [2 - - 2]

Course Learning Outcome

By the end of the course, students will be able to

1. Understand the Indian Legal System and Basics of different laws.
2. Understand, explore, and acquire practical insight of legal system and its application in engineering profession.

Syllabus

Unit I

Introduction to Indian Legal System: Constitution of India, Sources of Law and Judicial system

Unit II

1.Contracts and its Elements: Employment contracts, Contract Interpretation, Service Contract, Contract of Indemnity, Law of Agency

2.Employment agreement

UNIT 3

1Legal Documentation: Drafting of legal documents including Non-Disclosure Agreements (NDA), Request for Proposal (RFP), collaboration agreements, joint venture agreements, tendering and sub-contracting

UNIT 4

1.Intellectual Property Rights (IPR): Overview

2.Trademarks, Copy Rights, Patents with special emphasis in Biotechnology Inventions, software, circuits and design

3. Protection in Foreign Countries

UNIT 5

1. Cyber Laws, E-Commerce and E-Governance

UNIT 6 Introduction to Labour Laws

1. Labour Laws: Provident Fund, ESIC, Gratuity, Bonus, Perquisites, Contract labour

2. Health, Safety and welfare of construction workers.

UNIT 7

Taxation: Income Tax, Service Tax, VAT, Excise Duty

UNIT 8

Alternate Dispute Resolution (ADR) in Domestic and International dealings

UNIT 9

Introduction to Criminal Law

RTI Act

References

1. Karnika Seth, Computer Internet and New Technology Laws, Lexisnexis, First Edition 2013.
2. Prafulla C Pant, The Arbitration And Conciliation Act, 1996, Butterworths India, New Delhi.
3. Joseph Minattur, Indian Legal System, Indian Law Institute, New Delhi.
4. J. Beatson, Anson's Law Of Contract, Oxford University Press.
5. V. S. Datey , Indirect Taxes: Law And Practice, Taxmann Publications (P) Ltd, Latest Edition
6. Dr. Vinod K. Singhania And Dr. Monica Singhania , Student's Guide To Income Tax, Taxmann Publications (P) Ltd, Latest Edition.
7. S.C. Srivastava, Industrial Relations And Labour Laws, Vikas Publishing House Pvt. Ltd.

EC601 Digital System Design [3 0 2 4]

Course Learning Outcomes:

After successful completion of the course, the students will be able to

1. learn the fundamentals of digital system design using the concept of digital circuit along with various system problems that arise in digital system design
2. design the finite state machines to control complex systems, along with the design concept of data path and control path design
3. design Asynchronous Systems; to solve races and essential hazards in the asynchronous system
4. learn architecture of various reconfigurable devices
5. implement digital system using Hardware Description Language and the synthesis tool

Syllabus:

MSI & LSI Circuits and their Applications: Design of MSI & LSI circuits, Applications of useful digital circuits: comparators, multiplexers, demultiplexer, encoder and decoder, wired logic, Practical aspects of wired logic and bus oriented structures, advanced algebra simplification methods, Advanced K-Map method, Hazards in combinational circuits

Synchronous Finite Sequential Machines: Design of synchronous sequential machines: Mealy and Moore machine, Counter design using sequential Machines, Multimode Counters, Reduction of state table and state assignment, Design of sequence detectors and code converters, Timing and Triggering consideration in sequential machine, Clock skew, Design of networks for arithmetic operations

Hardware Description Languages (Verilog): Fundamentals of Verilog, Overview of Digital Design with Verilog HDL, Hierarchical Modeling Concepts: Top-down and bottom-up design methodology, Modules and Port, Gate-Level Modeling, Dataflow Modeling, Behavioral Modeling, Tasks and Functions, RTL Description of Simple Machine and Design from RTL description

Asynchronous Finite State Machine: Asynchronous sequential circuit analysis, primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, clock skew and timing considerations, Design of Asynchronous Machines

Programmable Logic Devices and System Controllers: Use of MSI Decoders and MSI Multiplexers in system Controllers, Architecture of ROM, PROM, PAL and PLA, System controller design using PROM, PAL and PLA

Reconfigurable Device Architectures: Classification of FPGA, Basic architecture of CPLD and FPGA, Xilinx's CPLD and FPGA architecture

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. C.V.S. Rao, Switching theory & logic design, Person Education
2. Samir Palnitkar, Verilog HDL : A Guide to Digital Design and Synthesis, Prentice Hall
3. Charles H. Roth Jr, Lizy Kurian John - Principles of Digital System Design Using VHDL, Cengage Learning
4. William I. Fletcher, An Engineering Approach to Digital Design, Prentice Hall of India
5. Chan and Mourad, Digital Design using Field Programmable Gate Arrays, Prentice Hall of India

EC602 Antenna and Wave Propagation [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. to understand and apply the basic concepts of antennas like gain, beamwidth, directivity, radiation pattern, etc
2. to understand the principle of operation of various antennas and their design
3. design antennas for various practical applications to meet given specifications

Syllabus:

Basic Antenna Concepts and Theorems: Various definitions, antenna parameters, transmission formula, duality and reciprocity theorems

Point Sources and Arrays: Power patterns of various sources, Arrays of 2 isotropic point sources, non-isotropic point sources, principles of pattern multiplication, linear arrays of non-isotropic point sources of equal amplitude & spacing, broad side, end fire arrays, radiation pattern determination of linear arrays, Dolph-Tchebysheff distribution for linear arrays, planar arrays

Wire Antennas:

Electric Dipole and Thin Linear Antennas: Short electric dipole radiation of short dipole, various field components radiation patterns, radiation resistance of linear antenna, radiation resistance of half wave dipole, monopole antenna, folded dipole antenna

Loop Antennas: EMF equation of loop antenna, directivity, Small loop short magnetic dipole, comparison of far field of small loop and short dipole loop antennas, field pattern of circular loop antenna & its radiation resistance

Helical Antennas: Helical geometry, transmission radiation modes

Yagi-Uda Antenna

Aperture Antennas:

Reflector Antennas: Radiation mechanism, types of reflector antennas, applications

Slot, Horn and Complementary Antennas: Slot antennas and their patterns, principle of complementary antennas, horn antennas

Microstrip Antennas:

Patch Antenna: Radiation mechanism, feeding techniques, advantages, disadvantages and applications, rectangular and circular patch antennas

Antennas for Special Applications: Antennas for satellite communication, radar, remote sensing, cellular communication, etc.

Antennas Measurement: Measurement of pattern gain, 3db Beam width, Side lobe and back lobe measurement phase polarization, impedance, Antenna noise measurement

Radio wave Propagation: Modes of propagation, Definitions, Multi-hop propagation

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. J. D. Krauss, Antennas, McGraw Hill
2. C. A. Balanis, Antenna Theory, Analysis and Design, Wiley
3. Jordan & Balmain, Electromagnetic wave & radiating systems, PHI Publication
4. K.D. Prasad, Antennas & Wave Propagation, Satya Prakash Publications

EC603 Fiber Optic Communication [3 0 2 4]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand the propagation of light signal through optical fibres and analyse performance degradation due to signal distortion
2. investigate performance of different types of light sources and detectors, transmitters and receivers
3. estimate coupling of power to optical fibers from different sources and losses due to connectorization, splicing and misalignments
4. design a point-to-point fiber optic link
5. apply measurement techniques for measurement of various optical parameters

Syllabus:

Overview of Optical Fiber Communications: Electromagnetic spectrum Evolution of fiber optic system, Elements of an optical fiber transmission link

Optical Fibers: Structures, Wave guiding and fabrication: Optical laws and definitions, optical fiber modes and configurations, Mode theory, single mode and graded index fibers, fiber materials, fabrication and mechanical properties, fiber optic cables

Signal Degradation in Optical Fibers: Attenuation, signal distortion in optical waveguide, pulse broadening in graded index fiber, mode coupling

Optical Sources: Light emitting diode (LEDs)-structures, materials, Figure of merits, characteristics & Modulation, Laser Diodes -Modes & threshold conditions, resonant frequencies, structures, characteristics and figure of merits, single mode lasers, Modulation of laser diodes, temperature effects, Light source linearity

Power Launching and Coupling: Source-to fiber power launching, Lensing schemes, fiber-to-fiber joints, LED coupling to single mode fibers, fiber splicing, and connectors

Photo Detectors: Principles of operation, types, characteristics, figure of merits of detectors photodiode materials

Optical Receiver Operation: Receiver operation, Specification, Preamplifier types

Transmission Systems: Point–to-point link, system requirements and design of link, Multi-channel Transmission Techniques

WDM Concepts and Components: Principles of WDM, DWDM, Passive Optical Components, Tunable sources and Filters

Advances in Optical Fiber Systems: Telecommunications & broadband application, SONET/SDH, EDFA, Optical switching

Fiber Optical Measurements: Measurement of Attenuation, Dispersion, NA, OTDR, EYE pattern Technique

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

References:

1. Gerd Keiser, Optical Fiber Communication, McGraw Hill

2. Mynbaev & Scheiner, Fiber-Optic Communications Technology, Pearson Education
3. John M. Senior, Optical Fiber Communication, PHI

EC605 Mini Project-II [0 0 2 1]

Course Learning Outcome:

After successful completion of the course, students will be able to

1. practice acquired knowledge within the chosen area of technology for project development
2. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. reproduce, improve and refine technical aspects for engineering projects
4. work as an individual or in a team in development of technical projects
5. communicate and report effectively project related activities and findings

Syllabus:

Mini project may be carried out in one or more form of following:

product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

EC622 Modern Processor Architecture [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, the students will be able to

1. understand the pipelined and Superscalar architecture
2. apply the basic knowledge and calculate the overall performance
3. understand Advanced register and instruction data flow techniques and execution of multiple threads
4. analyze micro and multicore architecture

Syllabus:
Processor Design: The Evolution of processors, Instruction set Processor design, Principles of Processor performance, Instruction level parallel processing
Pipelined Processors: Pipelining fundamentals, pipelined processor design, deeply pipelined processors
Memory and I/O systems: Computer system overview, Latency and bandwidth, memory hierarchy, virtual memory systems, memory hierarchy implementation, I/O systems
Superscalar Organization: Limitations if Scalar pipelines, Superscalar pipeline overview
Superscalar Techniques: Instruction Flow techniques, Register Data Flow Techniques, memory data flow Techniques
Advanced Instruction Flow techniques: Static and Dynamic Branch Prediction techniques, Hybrid branch predictors, Instruction Flow issues and techniques
Advanced Register Data Flow Techniques: Value locality and redundant execution, Value Locality with speculation, value locality without speculation
Executing Multiple Threads: Synchronizing Shared memory threads, introduction to multiprocessor systems, explicitly multithreaded processors, implicitly multithreaded processors, executing the same thread
Case Studies of Superscalar Processors: The PowerPC 620, Instruction fetching, dispatching, execution and completion Intel'sP6 Microarchitecture, Basics of the P6 micro architecture, pipelining, the in order front end, out of order core, retirement, memory subsystem

Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. John Paul Shen, Mikko H. Lipasti, Modern processor Design Fundamentals of Superscalar Processors, TMH
2. Daniel Tabak, Advanced Microprocessors, TMH
3. J. Hayes, Computer Architecture and Organization, McGraw-Hill
4. William Stallings, Computer Organization & Architecture Designing For Performance, Pearson
5. Behrooz Parahami, Computer Architecture from Microprocessor to Super Computer, Oxford.

EC611 Digital Integrated Circuit Design [3 0 0 3]

Course Learning Outcome :

Upon completion of this course, students will be able to:

1. understand the basics of VLSI design and IC fabrication
2. analyze the VLSI circuits working under different load and bias conditions
3. evaluate the performance parameters of digital VLSI circuits
4. design various combinational, sequential and dynamic logic circuits using CMOS
5. simulate and optimize various VLSI circuits and layouts of the same

Syllabus:

Introduction of VLSI: Historical perspective, objective and Organization, Overview of VLSI design Methodologies, VLSI design flow, Design Hierarchy, Concept of Regularity, Modularity and Locality, VLSI design Styles , Design Quality , Packaging Technology , CAD Technology

Fabrication of MOSFET: Introduction, Fabrication Process flow: Basic steps, CMOS n-Well Process, Layout Design rules, full custom mask layout design

Scaling and Effects of Scaling on MOS: MOSFET scaling, Small-geometry effects, MOSFET capacitances

MOS Inverter Static Characteristics: Introduction, Resistive load Inverter, Inverter with n-type MOSFET load (Enhancement & Depletion type MOSFET load), CMOS Inverter

MOS Inverters Switching Characteristics and Interconnect Effects: Introduction, Delay-time definitions, Calculation of Delay times, Inverter design with delay constraints, Estimation of Interconnect Parasitic, Calculation of interconnect delay, Switching Power Dissipation of CMOS Inverters

Combinational MOS Logic Circuits: Introduction, MOS logic circuits with Depletion NMOS Loads, CMOS logic circuits, Complex logic circuits, CMOS Transmission Gates (TGs)

Sequential MOS Logic Circuits: Introduction, Behavior of Bistable elements, The SR latch circuit, Clocked latch & Flip-flop circuit, CMOS D-latch & Edge-triggered flip-flop

Dynamic Logic Circuits: Introduction, Basic Principles of pass transistor circuits, Voltage Bootstrapping, Synchronous Dynamic Circuit Techniques, CMOS Dynamic Circuit Techniques

Self Study:

Students will be given an advanced topic in a group of three, the presentation for the same will be taken during starting of each class. Around 10% of the questions will be asked from self study contents.

References:

1. Sung Mo kang, Yusuf Leblebici, CMOS Digital Integrated circuits, Analysis and Design, TATA McGraw-Hill
2. Amar Mukerji, Introduction to nMOS and CMOS VLSI System Design, Prentice Hall
3. Neil H. E. Weste, David Money Harris, CMOS VLSI Design A Circuits and Systems Perspective, Addison, Weasley
4. Pucknell & Eshraghian, Basic VLSI Design, PHI

EC612 Analog Integrated Circuit Design [3 0 0 3]

Course Learning Outcome:

Upon completion of this course, students will be able to

1. understand different design parameters for Analog CMOS Design
2. design of Operational amplifier for various applications as per the user specifications
3. apply different Design steps for Analog IC Circuits
4. analyze modeling of CMOS Device

Syllabus:

Introduction and Background: Analog Integrated circuit design, Notation, symbology and Terminology, Analog signal processing, example of Analog VLSI mixed signal circuit design.

CMOS Device Modeling: Simple MOS large signal model, small signal model for the MOS transistor, subthreshold MOS model.

Noise Analysis: Noise in single stage amplifiers, noise in Differential amplifiers.

Analog CMOS Sub Circuits: MOS switch, MOS diode/Active resistor, current sinks and sources, Voltage references along with current mirrors.

CMOS Amplifiers: Analog CMOS Inverters, differential amplifiers, cascade amplifiers, current amplifiers.

CMOS Operational Amplifiers: Design of CMOS Op Amps, compensation of Op amps, Design of two stage op-amp, measurement parameters of op-amp.

Comparators: Characterization of comparator, Two-Stage cascade open loop comparator.

Switched Capacitor Circuits: Basic concept, switched capacitor amplifiers, switched capacitor integrators.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Bezad Razavi, Design of Analog CMOS Integrated Circuits, New York: McGraw Hill.
2. Philip E.Allen, Douglas R.Holberg, CMOS Analog Circuit Design, Oxford Press.
3. David and Martin, Analog Integrated circuit design, Wiley publication.

EC621 System Modeling and Design [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand background of the traditional software engineering approach for Embedded Systems
2. apply modular-based software design
3. apply Model-driven Architecture (MDA) approach to software development
4. understand and apply different languages for modeling and performing transformations from an abstract model
5. design real-life applications of model-driven engineering in different areas of Embedded Systems

Syllabus:

Model-Driven Design and ASM-Based Validation of Embedded Systems:
UML as Front-End Language for Embedded Systems Design, Abstract and Concrete Data Type Optimizations at the UML and C/C++ Level for Dynamic Embedded Software, Concern Separation for Adaptive QoS Modeling in Distributed Real-Time Embedded Systems
High-Level Design Space Exploration of Embedded Systems: Model-Driven Engineering: Modular Design, Architecture, and Aspect-Oriented Design Approaches
Model-Based Development of Distributed Real-Time Systems: Using Timed Automata for Modeling the Clocks of Distributed Embedded Systems, Model Checking of Multitasking Real-Time Applications Based on the Timed Automata Model Using One Clock
Modeling for Behavioral Simulation and Performance Estimation of Embedded Systems: System C Platform. Transaction Level Model Automation for Multicore Systems, The Role of Programming Models on Reconfigurable Computing Fabrics
Case Studies: Reconfiguration of Industrial Embedded Control Systems, Architecture Description Languages for the Embedded Domain, Model-Based Testing of Embedded Systems

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. Miro Samek, Practical UML Statecharts in C/C++: Event-Driven Programming for Embedded Systems, Elsevier
2. Luís Gomes and João M. Fernandes, Behavioral Modeling for Embedded Systems and Technologies: Applications for Design and Implementation, Information Science publication
3. Anne Kleppe, The Model Driven Architecture: Practice and Promise, Addison-Wesley Longman Publishing Co.
4. Claudius Ptolemaeus, System Design, Modeling, and Simulation, Claudius Ptolemaeus Editor
5. Edward A. Lee, Concurrent Models of Computation: An Actor, Oriented Approach, UC Berkley

EC641 Telecom Networks [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. learn basic concepts of telecom network and tele-traffic theory
2. understand transmission aspects of digital signal over telecom network, problems and solutions
3. design and analyze signaling and switching techniques
4. interpret various telecom standards

Syllabus:

Introduction: History, evolution of PSTN, basics of transmission, switching, networking and signaling

Traffic Engineering: Unit of traffic, Poisson's model, Markov's B-D process model, Erlang's lost call system, Queueing systems

Transmission and Switching: Basic Switching Requirements, Concentration and Expansion, Evolution of switches, Common Control (Hard-Wired), Stored Program Control, Concentrators and Remote Switching, Two-Wire and Four-Wire Transmission, hybrid, Primary multiplexing

Transmission Aspects of Voice Telephony: Operation of a Telephone Subset, Subscriber Loop Design, Subscriber Loop Length Limits, Extending the Subscriber Loop, Design of Local Area Wire-Pair Trunks, Inductive Loading of Wire-Pair Trunks, Local Trunk Design Considerations, VF Repeaters

Digital Networks: Digital transmission PCM standards, Line codes, Regenerative repeaters, Enhancements of E1 and T1, High order PCM multiplexing, Long distance PCM transmission, Digital loop carrier, Digital switching systems, Digital network requirements

Signaling Techniques: Types of signaling, classification, basic loop signaling, Associated and Disassociated Channel Signaling, Signaling in the Subscriber Loop, CCITT signaling system 7 (SS7) – Architecture

Local and Long-Distance Networks: Local network design, Design of long distance network, numbering plan, exchange location, hierarchy, traffic routing in national network, Transmission Factors in Long-Distance Telephony- causes of Echo, signing and methods to eliminate them

Cellular and PCS Radio Systems: Basic Concepts of Cellular Radio, Radio Propagation in the Mobile Environment, fading, Network Access Techniques, frequency reuse, Cordless Telephone Technology, Wireless Local area network, mobile satellite communication

Advanced Telecom Network: ISDN, B-ISDN, ATM, Frame relay, VoIP

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. Roger L. Freeman, Fundamentals of Telecommunication, Wiley
2. Robert Winch, Telecommunication transmission systems, McGraw hill
3. J.E.Flood ,Telecommunication Switching Traffic and Network, Pearson

2EC359 ADVANCED COMMUNICATION SYSTEMS **L T P C**

3 - - 3

Satellite Communication systems: Orbital Mechanics- Kepler's laws, Orbits, Orbital effects, Orbital perturbations,Satellite sub systems- AOCS, TTC&M, Antennas, Transponders,Earth station technology,Link calculation,Satellite systems- GEO systems, non-GEO communication systems,Satellite Applications- Global Positioning System, Very Small Aperture Terminal system, Direct to Home Satellite Systems

Cellular Communication Systems: 2G TDMA standard GSM- standards, architecture, radio aspects, security, call flow, 2G CDMA standard IS-95- Service aspects, key features, radio aspects, forward and reverse channel processing, challenges,3G mobile systems- IMT 2000 vision, radio aspects, UMTS, network aspects, CDMA 2000, W-CDMA

Mobile Data Communication Systems: Circuit switched data services- HSCSD**,** Packet switched data services- GPRS, CDPD, EDGE

Radar Systems: The Radar Equation, Detection of Signal in Noise, Integration of Radar Pulses, Transmit Power, Pulse Repetition frequency, system losses, Antenna Parameters and Radar Equation consideration,MTI and Pulse Doppler Radar, Doppler Filter Banks, Digital MTI Processing Detector, Pulse Doppler Radar,Tracking Radar, Monopulse Tracking, Conical Scale and Sequential Lobbing, Comparison of Trackers, Automatic tracking with Surveillance Radar

Recent Advances: Ultra wideband systems (UWB), Push To Talk (PTT) technology, Mobile IP

Books:

1. Introduction to wireless & Mobile systems- D.P.Agarwal, Qing-An zeng- Thomson P
2. Wireless communications, principles and practices, Theodore S. Rappaport Pearson Education.
3. Radar Systems by Skolnik

L	T	P	C
2	0	2	3

Course Code	CE006
Course Title	Operating Systems

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

1. understand the components and functionalities of a typical operating system
2. identify synchronization needs of various system resources for optimal utilization
3. experiment with various control and scheduling activities of operating system components

Syllabus:

Teaching Hours:

Unit I

Introduction: Evolution of operating systems, operating system services, types of operating system, different view of operating system, Review of types of I/O polled, interrupt driven and DMA. Process Scheduling: Concepts of Process, attributes of process, process control block, data structures. Processes and threads, process status, scheduler: long term, medium term, short term scheduler, matrix of evaluation, scheduling algorithms. 7

Unit II

Inter process Communication(IPC):Need of IPC, concurrency, Race conditions, critical section, mutual exclusion problem, solution approaches, algorithmic approaches, critical region, condition for critical region, semaphore : Binary ,counting, the queuing implementation. Monitors, message passing: synchronous vs asynchronous message exchange. Classical IPC Problems: Dinning Philosopher Problem, Sleeping Barber Problem, Reader's & Writer Problem, procedure control. 6

Unit III

Deadlock - Deadlock problem, deadlock characterization, dealing with dead lock, deadlock prevention, deadlock avoidance. Memory Management - Paging: Principle of operation, page allocation, h/w support for paging, multiprogramming with fixed no. of task, multiprogramming with variable no. of task, segmentation, virtual memory : concept of demand paging, page replacement algorithms, thrashing. 7

Unit IV

Input Output Management-Principles of input/output: Input / Output devices, device controllers, direct memory access, principles of input/output s/w : goals of the input/output s/w, concepts of interrupt handler and device driver, devices as files, the inode structure and organization. 5

Unit V

File Systems: file structure, file types, file access, file attributes, file operations, memory mapped files and directories: hierarchical directory system, pathnames, directory operations, contiguous allocation, linked list allocation, linked list using index, Inodes, Concepts of Shared files.	5

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

1. William Stalling, Operating System – Internals, Prantice Hall
2. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall
3. Peterson, Operating System Concepts, Addition-Wesley Longman Publishing Co
4. Milan Milenkovic, Operating System – Design & Concepts, Mc Graw Hill
5. Stephen Prata, Advanced Unix - A Programmer's Guide, BPB Publications
6. Yashwant Kanitkar, Unix Shell Programming, BPB Publications
7. Sumitabha Das , Unix System V.4 Concepts & Applications, Pub. TMH
8. Maurice Bach, The Unix Operating System, Prentice Hall

L= Lecture, T= Tutorial, P= Practical, C= Credit

^This is not an exhaustive list

Course Code	2CL102
Course Title	Environmental Studies

Course Learning Outcomes:

At the end of the course, students will be able to –

1. appraise the multidisciplinary nature of environment and sustainability
2. explain types of environmental pollution and its control measures
3. outline social issues related to environment

Syllabus: Teaching Hours: 15

Unit 1: Multidisciplinary Nature of Environment Hours: 04

Environment and its multidisciplinary nature, Ecosystems, biodiversity and its conservation, concept of sustainability, Environmental Impact Assessment, public awareness towards environmental conservation, Environmental legislation, carbon credit and carbon trading

Unit 2: Environmental Pollution, Global Warming and Climate Change Hours: 07

Types of environmental pollution and pollutants, causes, effects and control measures of – air pollution, water pollution, soil/land pollution, noise pollution, radioactive pollution. Role of an individual in prevention of pollution. Case studies on pollution, Effects – acid rain, ozone layer depletion and greenhouse effect. Sources, types and effects of waste, waste disposal and management, e-waste management

Unit 3: Social Issues related to Environment Hours: 04

Environment ethics- issues and solutions. Energy and water conservation, rain water harvesting, water shed management, rehabilitation problems and concerns, environmental protection acts.

Self-Study:

The self-study contents will be declared at the commencement of semester.

Tutorial Work:

Tutorial work will be based on above syllabus with minimum 05 Assignments to be incorporated.

Suggested Readings:

1. Dara, S. S., & Mishra, D. D. A textbook of Environmental Chemistry and Pollution Control. S. Chand & Company Ltd.
2. Bharucha, E., Textbook of Environmental Studies, Universities Press.
3. Dhameja, S. Environmental Studies. S. Kataria and Sons.
4. Ristinen, R., & Kraushaar, J. Energy and the Environment, Wiley Publications.
5. Masters, G. Introduction to Environmental Engineering and Science. Prentice-Hall Publications.
6. Basak, A. Environmental Studies. Pearson Publications.

L= Lecture, T= Tutorial, P= Practical, C= Credit

IC002 Programmable Logic Controller [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

- understand the fundamental principles of Programmable logic controller, I/O modules
- develop the ability to design program using standard programming technique
- develop and design an application orientated project using PLC

Syllabus:

Introduction: Definition, advantages and Importance of PLC, Evolution history of PLC, Architecture and block diagram.

PLC hardware : Types of PLC, CPU unit architecture, Input/Output devices and interfacing, Hand held programming terminals, Industrial computer and monitors,

PLC operation: Ladder logic, Logic functions, Wiring diagaram

PLC Programming: Basic relay instructions, timer-counter instructions, comparison, data handling, input-output instructions, sequencer instruction

PLC applications and case studies.

Self Study:

The self study contents will be declared at the commencement of semester.Around 10% of the questions will be asked from self study

References:

1. Webb and Reis, Programmable Logic Controllers, Principles and Applications.

2. Mitra and Gupta, Programmable Logic Controllers and Industrial Automation an Introduction.

Course Code	HS003
Course Title	INTRODUCTION TO ACCOUNTING

Course Learning Outcomes:

After the successful completion of the course, students will be able to

1. Understand various concepts of financial and cost accounting
2. Analyze the financial and cost statements
3. Evaluate the financial performance of enterprises

Syllabus: **Teaching Hours: 45**

Section I

Financial Accounts

Unit I **7**

Accounting equation,

Unit II **5**

Journal,

Unit III **4**

Cash book

Unit IV **3**

Ledger

Unit V **2**

Trial Balance

Unit VI **3**

Profit & Loss Account

Unit VII **2**

Balance Sheet

Section II

Cost Accounts

Unit VIII **5**

Cost classification (direct cost, indirect cost, variable cost, fixed cost) Prime cost, conversion cost,

Unit IX **4**

Full cost	
Unit X	**2**
Cost - Volume – Profit Analysis	
Unit XI	**4**
Absorption costing	
Unit XII	**1**
Activity based costing	
Unit XIII	**1**
Budgetary control	
Unit XIV	**2**
Standard costing	
Total	**45**

Reference Books:

Accounting for Managers by Jawaharlal TMH

Accounting Principles by Anthony &bn . Reece, AITB

HS005/ 2HS005 Technical Writing

Course Learning Outcome

After successful completion of the course, student will be able to

1. Participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
2. Understand how to apply technical information and knowledge in practical documents for a variety of a.) professional audiences (including peers and colleagues or management) and b) public audiences.
3. Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.

An introduction to technical writing

- Technical writing vs. General writing b. Purpose, importance and characteristics of technical writing.
- Objectives of technical writing: Clarity, conciseness, accuracy, organization, ethics.
- Audience recognition and involvement: High tech audience, low-tech. audience, gender neutral language.

Memorandum:

- Objectives, difference between memos, letters and emails. Criteria and format for writing and memos.

Technical description:

- Criteria and process.
- Technical instructions for user's manual

Report Writing:

- Characteristics, types and writing of various reports: feasibility reports, inventory report, mishap report, progress report, laboratory report.

Letter- writing:

- Business letters, Job-applications, Resume.

Business Proposals:

- Types & formats.

Graphic representation of Technical Data

SOP writing

Promotional Writings

- Technical Brochure designing
- Content writing for Websites (For promotional and troubleshooting purposes)
- Writing Fliers and Newsletters

Academic Writing

- Summaries, abstracts and instructions

Case studies on Technical Writing.

Reference Books:

1. Sharon J. Gerson and Steven M. Gerson, , Technical writing – process and product ,Person Education Asia .

2. Andrea J. Ratherford ,Basic Communication Skills for Technology,Person Education Asia
3. Pfeiffer, W.S. and T.V.S. Padmaja. Technical Communication. Pearson
4. Muralikrishna and Sunita Mishra. Communication Skills for Engineers. Pearson

L	T	P	C
3	0	0	3

Course Code	2HS006
Course Title	Elements of Marketing Management

Course Outcomes (CO):

At the end of the course, students will be able to-

1. understand the basic concepts of marketing management
2. analyze the significance of product, place, price and promotion of marketing-mix
3. evaluate the marketing strategies

Syllabus: Teaching Hours: 45

Unit I **6**

Basic Marketing Concepts:Concept of marketing, core marketing concepts, importance and scope of marketing, company orientation towards market place

Unit II **8**

Product: Product and product mix, importance of product, product objective, product strategy planning for new product

Unit III 6

Marketing Environment: Demographic, Economic natural, Technical, Political, legal, social cultural

Unit IV **6**

Consumer Buying Behaviour: Influences on buyer behaviour, buying decision process,Market segmentation – levels, pattern and procedure

Unit V **8**

Distribution Channel: Importance and factors of distribution channels, typs of channels, channels of distribution – consumption good, industrial goods, nature and type of retailers Function and type of wholesalers, selecting distribution, channels

Unit VI **6**

Pricing: Nature and Importance of pricing, objectives of pricing. Considerations in price determination approaches to pricing

Unit VII **3**

Promotion: Promotion and its elements, objectives of promotion, promotion mix

Unit VIII **2**

Marketing Research: Nature and scope, process of market research, uses and limitations

Self -Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self -study contents.

Suggested Readings^:

1. Kotler Philip, Marketing Management, PHI Publication.

2. Saxena Rajan, Marketing Management Tata McGraw Hill Pvt. Ltd.
3. Agarwal R.D., Organization and Management, Tata McGraw Hill Pvt. Ltd.

L = Lecture, T = Tutorial, P = Practical, C = Credit

^ this is not an exhaustive list

Course Code	HS014
Course Title	Banking and Finance

Course Learning Outcomes:

After the successful completion of the course, students will be able to

1. Understand various concepts of banking and financial system
2. Analyze the financial products and services
3. Evaluate the mechanism of banking and financial system

Syllabus: **Teaching Hours: 45**

Units	Teaching Hours
Unit I	**15**
Indian Financial System: The Financial System, Nature, Evolution and Structure, the Functions of Financial Intermediaries, Financial Instruments, the Role of Financial System in Economic Development, the Indian Financial System. The Origin and Growth of Banking of Banking, Functions of Commercial Banks, Banking in the New Millennium.	
Unit II	**1**
Banker Customer Relationship: Types of Accounts, Types of Relations, KYC Norms, Banker – Customer relationship, Rights and Duties of Banker/ Customer, Importance provisions of NI Act	
Unit III	**3**
Sources &Uses of Funds: Bank Balance sheet, Sources & Uses of Funds in a Bank. Form of Balance Sheet of Banking Companies. Different Schedule under Banking Regulation Act. – Provisioning norms of CRR & SLR	
Unit IV	**3**
Deposit Management: Importance of Deposit, Types of Deposit in India, USA & Europe. NRI Deposits, Cost of Deposit & its impact on Profitability, concepts of Fixed & Floating Rate of Interest, Deposit Insurance.	
Unit V	**5**
Cheques: Special Features Negotiability, Validity, Crossing & Endorsement.	
Unit VI	**2**
Cash Management: Importance of Cash Management issues, Cash at Counter, Vault & Currency Chest.	
Unit VII	**2**
Lending Activities: Lending activity, Basic requirements for lending.	
Unit VIII	**2**

Credit Policy: Need for Credit Policy, Components of Credit Policy, Credit Policy Pursued by the Government, Bench Marks Exposure Norms, Credit Culture.	
Unit IX	**2**
Retail Banking: Basics of Retail Banking, Forms of Retail Banking and Emerging issues	
Unit X	**2**
Corporate Banking: The nature of corporate banking, Developments in corporate banking, Consortium finance, Multiple banking arrangements, and Loan syndication	
Unit XI	**6**
Feebased Services: Feebased Services L/C,B/G, Subsidary services, Bancassurance, Demat Account, Safe Deposit Locker , Mutual Funds, Merchant Banking Activities – Management of Public issues, Reasons, Eligibility norms, Regulatory framework, Marketing of issues, Post issue activities	
Unit XII	**2**
Plastic Money: Different types of plastic money, Concept of a credit card, Distinction between Credit card, Charge card and Debit card, Mechanics of a credit card transaction, Credit card as an augmented retail financial product, Credit card business in India, The merging scenario CRM, (AWB, ATM, Mobile Banking Internet Banking) Delivery Channels (Payment & settlement services)	

Reference Books:

1. Management of Banking & Financial Services - Paul, Justin / Suresh, Padmalatha. Pearson – 2007
2. Financial Institutions and Markets, 4th e Bhole, LM. Tata McGraw Hill 2004
3. Indian Financial System, Theory and Practice, 4th e, Khan, M Y. Tata McGraw Hill 2004

HS016 Applied Literature [3 0 0 3]

Course Learning Outcome

Students completing this subject will:

1. be able to explore the importance of textual traditions in shaping responses to other places, peoples, cultures;
2. gain a knowledge and understanding of the social, political and intellectual forces contributing to imperial, third world and migrant writing;
3. develop a knowledge and appreciation of the subject matter, styles and narrative conventions

Syllabus

Non-fictional Prose Works (Excerpts)

New Branded World by Naomi Klein

From the Gutenberg Elegies: The Fate of Reading in the Electronic Age by Sven Birkets

Decolonising the Mind by Ngugi wa Thiong'o

Idea of India by Sunil Khilnani

Wings of Fire by APJ Kalam

Poems

Night of the Scorpion by Nissim Ezekiel

Little Red-Cap, by Carol Ann Duffy

Hunger by Jayanta Mahapatra

The Dacca Gauzes by Agha Shahid Ali

The Howl by Allen Ginsberg

If you forget me by Pablo Neruda

Still I rise by Maya Angelou

If by Rudyard Kipling

"Hope" is the thing with feathers by Emily Dickinson

All You who Sleep Tonight by Vikram Seth

The Unknown Citizen by W. H Auden

Song of Myself, I, II, VI & LII by Walt Whitman

Short Stories

Short Story: "Seventeen Syllables" by Hisaye Yamamoto

Short Story: “The Gift of the Magi” by O. Henry

Criticism

Towards a Feminist Poetics by Elaine Showalter

Movies

The Prestige

To Sir, With Love

The Namesake

Sherlock – TV series

Troy

Jobs

References:

1. Widdowson, Peter. *Literature.* London: Routledge, 1999.
2. Miller, J. Hillis. *On Literature: Thinking in Action*. London: Routledge, 2002.
3. Mulhern, Francis, *Culture/Metaculture*. London: Routledge, 2000.
4. During, Simon, *The Cultural Studies Reader*. London: Routledge, 1993.
5. Leitch, Vincent B. *The Norton Anthology of Theory and Criticism*. Norton: New York, 2001.
6. Stam, Robert; Alessandra Raengo, *A Companioin to Literature and Film*. Blackwell: Oxford, 2004.

ME004 Cryogenics [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

1. describe various methods to produce low temperature and phenomena at cryogenic temperature.
2. understand the working principle of different cryogenic refrigeration and liquefaction system.
3. understand the functions and working principles of insulations and various low temperature measuring and storage devices.
4. understand the application of cryogenic technology in engineering research and industry.

Syllabus:

Low Temperature Properties – Mechanical, thermal, electrical and magnetic properties of engineering materials, properties of cryogenic fluids.

Gas Liquefaction Systems – Thermodynamically ideal system, Joule Thomson effect adiabatic expansion, simple, pre-cooled and dual pressure Linde Hampson systems, Claude system, Kapitza system, Heylandt system, other liquefaction system using expanders, comparison of liquefaction systems, liquefaction systems for hydrogen and helium

Cryogenic Refrigeration Systems – Ideal isothermal and isobaric source systems, Joule Thomson systems, pre-cooled Joule Thomson system, expansion engine system, Philips refrigerator, G M refrigerator, Pulse Tube refrigerator.

Measurement Systems for Low Temperatures – Temperature, pressure flowrate and liquid level measurement at low temperatures.

Cryogenic Fluid Storage – Basic storage vessel, construction of storage vessels for oxygen, hydrogen, nitrogen, helium, safe devices, drawing of the vessel.

Insulations – Gas filled powder and fibrous, vacuum, evacuated powder and fibrous, multiplayer insulations, mechanism of thermal insulation, apparent thermal conductivity, and selection of insulation

Cryogenic Fluid Transfer Systems – Different types of transfer lines, process of cryogenic transfer, components of transfer lines.

Application of Cryogenic Systems – Super-conducting bearing, motors, super-conducting magnets, space technology, blood and tissue preservation, cryo probes used in cryo surgery.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. R.F. Barron,Cryogenics systems, Mc Graw Hill Publication.
2. T.Flynn, Cryogenic Engineering, Springer Publication

EC701 Data Communication and Networking [3 0 2 4]

Course Learning Outcome:
After successful completion of the course, the students will be able to

1. understand the concept of communication protocols and standards
2. acquire the knowledge of Networking of computers
3. understand different layers of OSI model and learn the importance of each layer
4. learn different wired and wireless networks and their applications

Syllabus:
Introduction to Data Communication and Networking: Data communication, use of Networks, Internet Protocols and standards, layering of Models, OSI model, Internet model.
Physical Layer: Transmission media (Twisted pair, Coaxial cable, Fiber optic cable), Wireless Medium as Physical Layer (Electromagnetic Spectrum, ISM Band, Lighwave Transmission), Circuit switching, DSL technology, Cable modem, SONET, SDH.
Data Link Layer: Services to N/W layer, Framing, Bit Stuffing, Character Stuffing, Error control, Flow control mechanism stop & wait, Go-back-, Selective repeat. Example data link protocol HDLC, PPP.
Medium Access Layer: Channel allocation problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA
Local Area Network: Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, Blue tooth, Bluetooth low energy, Zigbee, Connecting devices- Repeaters, Hub, Bridges, Switch, Router, Gateways, Virtual LAN, Broadband Wireless Networks
Network Layer: Packet Switching, Virtual circuits and datagram, Static and Dynamic Routing Algorithms (Optimality principle, Static Routing Algorithms, Shortest Path, Flooding, Dynamic routing Algorithms, Distance Vector, Link state routing.), IP Addressing, CIDR & NAT, IP layer protocols (ICMP, ARP, RARP, DHCP, BOOTP), IPv4, IPv6.
Transport Layer: Elements of Transport protocols - TCP & UDP
Application Layer: DNS- Domain Name System, E-mail, FTP, HTTP, WWW, Firewall
Introduction to Network Security

Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. A. S. Tanenbaum, Computer Networks, PHI
2. Behrouz Forouzan, Data and Communication Networking, TMH
3. William Stallings, Data and Computer Communication, Prentice Hall Publication
4. Bhushan Trivedi, Computer Networks, Oxford Publication
5. James F. Kurose, Keith W. Ross, Computer Networking: A topdown approach, Pearson

EC702 Embedded Systems [3 0 2 4]

Course Learning Outcome:
After successful completion of the course, the students will be able to:

1. understand the general structure of an embedded systems, their design requirements and applications
2. design embedded system hardware and software programs to control embedded system
3. test hardware and software of embedded system
4. Learn Real Time Operating System and write Device Drivers
5. Understand and apply bus protocols for design of embedded system

Syllabus:
Introduction: Embedded Systems overview, characteristics of embedded systems, applications, common design metrics, and design challenges, Processor technology, IC technology, Design Technology, Types of Embedded systems, Hardware and software units of embedded systems, embedded system development tools, examples of embedded systems.
Processors and Controller: ARM Embedded Systems, ARM Processor Fundamentals and Architectures, ARM Instruction Set, ARM advanced Family processors, PIC Microcontroller and its Architecture.
Real Time Operating Systems: OS services, Network OS, RTOS in embedded systems, RTOS scheduling models, task enrolment and scheduling, task prioritization, context switching, multitasking, preemptive and cooperative inter task communication, event management, locking mechanism, interrupt handling, Introduction to Open Source RTOS like uCOS, FreeRTOS etc. and overview of Mobile OS.
Device Drivers: Introduction, their functions, architecture, types, and implementations.
Bus Protocol and Networks for Embedded Systems: USB, SPI, I2C, CAN Bus, Distributed embedded architecture.
Embedded Programming: Tools and Languages
Embedded System Design: Unified Modeling Language (UML),Case Study based on Recent Trends in Architecture and Applications.

Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:
Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. Shibu K. V, Introduction to Embedded Systems, TMH.
2. Frank Vahid, Tony Givargis, Embedded system design: A unified Hardware/Software introduction, Wiley
3. Steve Furber, ARM System-on-Chip Architecture, Addison-Wesley
4. Andrew N. Sloss, Dominic Symes and Chris Wright, ARM System Developer's Guide, Designing and Optimizing System software., Elsevier.
5. Muhammad ali mazidi, PIC Microcontroller And Embedded Systems : Using Assembly And Cn., Pearson education India

EC703 Microwave Engineering [3 0 2 4]

Course learning outcome:

After successful completion of the course, the students will be able to

1. understand the important and unique engineering issues, design challenges, etc. at RF and microwave frequencies
2. apply the knowledge of electromagnetic theory to understand the wave propagation in transmission lines and waveguides
3. use Smith charts to solve various microwave related problems
4. learn microwave network theory and the use of scattering matrix
5. describe and analyze the microwave components, such as waveguide Tees, couplers, isolator, circulator, matching devices, etc.
6. understand the structure, working principle and applications of solid state microwave active devices, microwave sources, etc.
7. handle microwave equipment and make measurements

Syllabus:

Introduction to Microwaves: Microwave frequencies, advantages of microwaves, and general applications of microwaves

Basic Transmission Line Theory: Transmission line equations & solutions, condition for distortion less line, lines terminated in load, open & short, standing wave and standing wave ratio, line impedance and admittance, impedance matching, problem solutions using smith charts

Microwave Wave-guides: Rectangular wave guides (With all necessary details and derivations), Circular wave-guides, corrugated wave-guide.

Microwave Components: Scattering Parameters, Wave-guide tees, magic tee, directional couples, circulars and isolators, corners, bends, twists, flanges, matched termination, coupling probes, loops

Microwave Tubes and Circuits: Limitations of conventional tubes at UHF & Microwave, Klystrons, velocity modulation, multi cavity klystron, reflex klystron, traveling wave tube, Magnetron.

Semiconductor Microwave Devices: Varactor diodes, step-recovery diodes, parametric amplifiers, tunnel diode, Gunn diode, PIN diode, schottky barrier diodes, Microwave transistors Bipolar transistor, Hetrojunction Bipolar transistor, MESFET, High electron mobility transistor (HEMT)

Micro Strip & Integrated Circuits: Strip lines and micro strip lines, MIC, MMIC

Radar Systems: Basic principle, radar range equation: powers and frequencies used in radar, basic pulsed radar system, moving target indication, CW Doppler radar, Factor Influencing maximum range, Pulsed system, Display Methods, Search and Tracking radar systems, Moving target indicator (MTI), CW Doppler Radar, Frequency Modulated CW radar, Introduction to SAR.

Introduction to Milimeter Wave and Tera Hertz Technology

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

References:

1. Samuel Liao, Microwave Devices and Circuits, PHI
2. David Pozar, Microwave Engineering, Wiley
3. Dennis Roddy, Microwave Technology, PHI
4. G. Kennedy, Electronic Communication Systems, McGraw-Hill Book Company

Annapurna Das, Sisir K.Das, Microwave Engineering, TMG

EC704 Minor Project [0 0 2 4]

Course Learning Outcome:

After successful completion of the course, student will be able to

1. practice acquired knowledge within the chosen area of technology for project development
2. identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
3. reproduce, improve and refine technical aspects for engineering projects
4. work as an individual or in a team in development of technical projects
5. report project related activities effectively to peers and mentors

Syllabus:

The student(s) shall carry out project based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit project report based on the work.

SS701 Organizational Behaviour [3 1 0 4]

Course Learning Outcomes (CLO):

After studying the course the students will be able to:

1. Analyze and evaluate performance behavior at individual, group and organizational levels.
2. Develop the ability to lead and motivate others to succeed.
3. Develop critical analytical skills that will help them diagnose situations pertaining to human behavior and generate effective solutions for the same.
4. Understand and apply principles of organizational dynamics relating to systems, culture, structure and change processes

Syllabus

I. Introduction to Organizational Behaviour

1. Concept of Organizational Behaviour (OB)
2. History , Nature and scope of OB
3. Key elements in OB
4. Inter-disciplinary contribution to OB
5. Managerial Roles

II. Individual Behaviour, Values & Personality

1. Concept of Individual Differences
2. Values commonly studied across culture
3. Fundamentals and Determinants of Personality
4. Big Five Dimensions
5. Personality Traits

III. Learning & Perception

1. Fundamentals of Learning
2. Learning Theories - Classical Conditioning Theory, Operant Conditioning Theory, Social Learning Theory
3. Behavior Modification
4. Definition of Perception, Perceptual Process, Common Perceptual Errors

IV. Motivation

1. Basic concept of Motivation
2. Theories of Motivation – Maslow,Herzberg's Two Factor Theory, ERG, McClelland , Equity and Vroom's Expectancy Theory

V. Leadership

1. Introduction
2. Leadership Theories - Trait Theories, Behavioral Theories and Situational Theories

VI. Group Dynamics

1. Defining and classifying groups
2. Stages of group development
3. Group Properties – Roles, Norms, Status, Size and Cohesiveness
4. Group Decision making

VII. Managing Change in Organization

1. Definition, Forces of Change,
2. Causes for Resistance to Change, Overcoming Resistance to change
3. Lewin's Change Model

VIII Organizational Culture

1. Meaning, Strong Culture vs. Weak Culture
2. Creating & sustaining Culture
3. Socialization

IX. Conflict, Power & Politics

1. Nature & types of conflict, Causes and outcome of conflict
2. Responses to conflict
3. Bases of Individual Power

4. Organizational Politics

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

References:

1. Robbins, S.P.Judge, T.A. &, Sanghi, Seema. (2010). *Organizational Behavior*, Pearson.
2. Pareek, U.(2011).*Understanding Organizational Behavior*, Oxford University Press.
3. Luthans,F.(2006).*Organizational Behaviour*, Tata McGraw Hill.
4. Sekaran,U. (1989).*Organizational Behaviour: Text and Cases*, Tata Mc Graw Hill
5. Kreitner, R. &Kinicki, A.(2012). *Organizational Behavior*, McGrawHill/Irwin
6. Davis,K. &Newstorm, J.W. (1989).*Organizational Behaviour*, Tata McGraw Hill
7. Slocum,J.W&Hellreigal, D. (2010).*Fundamentals of Organizational Behaviour*, Cengage Learning.

EC642 Satellite Communication [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand principle, operation and working of various sub systems of satellite as well as the earth station
2. analyze and design satellite link
3. apply communication techniques for satellite applications
4. learn advanced techniques and regulatory aspects of satellite communication
5. understand role of satellite in various applications

Syllabus:

Fundamentals: Concept, history & development

Orbital Mechanics & Launching: Kepler's law, perturbations, orbital effects, type of orbits, launching of satellite, launch vehicle technology

Satellite Sub Systems- Attitude & orbit control, thermal control, power supply, propulsion, telemetry, tracking & command, transponder, antennas

Satellite Link Design: Free space path loss, G/T ratio, equivalent noise temperature, G/T ratio, link budget, design for uplink, design for downlink, Inter satellite links

Communication Techniques for Satellite: Hybrid Modulation techniques, multiple access techniques

Earth stations: Configuration, classes, performance criteria, sub systems, antennas

Applications of Satellites: Telecom and data communication, Satellite navigation systems (GPS), Satellite broadcasting systems (DTH, world space radio), VSAT systems, mobile satellite systems, Remote sensing satellites

Advances in Satellite Communication: Synthetic aperture radar, high altitude platforms, Optical inter satellite links, integrated broadband satellite network

Regulatory Aspects and System Level Planning: Global regulations, planning for satellite mission

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. A.K.Maini, Satellite Communication, Wiley
2. Bruce R. Elbert, Introduction to Satellite communication, Artech house
3. Bruce R. Elbert, Satellite communication applications, Artech House
4. T.Pratt, Satellite Communication, Wiley
5. Dennis Roddy, Satellite Communication, Wiley.

EC713 Testing and Verification of Electronic Circuits [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand the need of testing also able to identify the different characteristics of verification, validation, testing and diagnosis in context of electronic circuits
2. effectively use the different verification tools and methods
3. analyse the various fault models
4. effectively use the automatic test equipment and automatic test pattern generator.
5. add DFT and BIST techniques in given electronic design

Syllabus:

Introduction to Testing: Testing philosophy, Role of testing, Digital and analog circuit testing, Technology trends affecting testing
Test Equipments, Economics and Quality: Test economics, Defining cost, Benefit-cost analysis, The rule of ten, Yield
Verification: Importance of verification, Verification plan, Verification flow, Levels of verification, Verification methods and languages
Functional Verification: Introduction to test bench, Test bench architecture, Types of test benches, Case study
Fault Modeling: Defects- Errors-Faults, Functional Versus Structural Testing, Level of fault models, A glossary of fault models, Single stuck at fault, Multiple stuck at faults, Fault equivalence
Automatic Test Pattern Generation: Digital circuit testing, Testability measures: Controllability, Observability, Basic ATPG, Combinational ATPG Algorithms
Design For Testability: Ad-hoc Design for Testability techniques, Structured DFT, Scan-Chain insertion, Scan architecture, Test for scan circuits, Full serial integrated scan, Multiple scan, Partial scan isolated serial scan, Nonisolated scan
Built In Self-Test: Introduction to BIST concepts, Hardcore, Level of test, Test pattern generation for BIST, Generic off line BIST architectures
System Level Test: Introduction to Boundary scan standards, JTAG-1149.1 standard, TAP/TAM, Memory test, IP core testing, Delay testing

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. M. L. Bushnell and V. D. Agrawal, Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits, Kluwer.
2. Janick Bergeron, Writing Testbenches, Functional Verification of HDL Models, Springer.
3. Abramovici, M. A. Breuer and A. D. Friedman, Digital Systems Testing and Testable Design, Wiley/IEEE Press.
4. Laung-Terng Wang et al., VLSI Test Principals and Architecture:, Morgan Kaufman.

EC733 Wireless Communications [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, student will be able to

1. understand wireless channels and identify suitable statistical models for fading channels
2. understand cellular network design concepts and apply them in designing of cellular network
3. analyze modulation techniques for wireless communication
4. learn concepts of equalization, diversity combining and apply them in wireless network
5. understand 2G and 3G cellular communication standards

Syllabus:
Mobile Radio Propagation-: Large scale effects, small scale effects, channel models, capacity of wireless channel
Cellular Communication Concepts : Frequency reuse, Co-channel and adjacent channel interferences, handoff techniques, channel assignment techniques, Techniques to improve capacity & reduce interference
Modulation Techniques: Constant envelope modulation-MSK, GMSK; Combined and linear modulation techniques-MPSK, QAM, MFSH, OFDM;
Equalization, Diversity: Fundamentals of equalization, generic adaptive equalization, survey of equalization techniques, linear equalizers, non-linear equalization, Algorithms for adaptive equalization, Diversity Techniques, Maximal ratio combining, Space diversity, polarization diversity, frequency diversity, Time diversity, RAKE receiver
Case Studies of Cellular standards : TDMA based 2G standard- GSM, CDMA based 2G standard – IS95, 2.5 G – GPRS, EDGE, 3G standards- WCDMA, CDMA200

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Theodore S. Rappaport, Wireless communications, principles and practices, Pearson Education India
   A. Goldsmith,Wireless Communication, Cambridge press
2. Upena Dalal, Wireless Communication, Oxford press
3. T. L. Singal, Wireless Communication, McGraw Hill
4. Kemilo Feher, Wireless Digital Communication, PHI

EC743 Wireless Sensor Networks [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

2. understand the concepts of Wireless Sensor Networks
3. understand and analyze the various wireless standards and protocols
4. understand and apply the various MAC, Routing, Transport Layer protocols
5. understand and evaluate the need of operating system in WSN

Syllabus:

Introduction and Overview of Wireless Sensor Networks

Evolution, Challenges in Sensor network design, various applications of sensor networks

Single-node Architecture

Hardware components, Energy management of sensor nodes, Examples of sensor nodes

Network Architecture

Sensor network scenarios - single hop and multi hop, network, multiple sink/sources, Optimization goals and figures of merit, Design principles for sensor networks

Time Synchronization, Localization and Positioning

Time synchronization problem, Protocols based on sender/receiver synchronization, Protocols based on receiver/receiver synchronization, Properties of localization and positioning procedures, Single-hop and Multi hop localization.

Medium Access Control Protocols for Wireless Sensor Networks

Fundamentals of MAC Protocols, Types of MAC protocols - Schedule-Based and Random Access-Based Protocols, Case Study- Sensor-MAC, Zebra-MAC

Routing Protocols for Wireless Sensor Networks

Routing Challenges and Design Issues, Routing Strategies - Flooding and Its Variants, LEACH, Directed diffusion, Geographical routing,SPIN

Transport Control Protocols for Wireless Sensor Networks

Feasibility of Using TCP or UDP for WSNs, Examples of Existing Transport Control Protocols-Congestion Detection and Avoidance, Event-to-Sink Reliable Transport

Wireless Network Standards

IEEE 802.11, Zigbee, Bluetooth

Operating system for Sensor Nodes

Embedded operating systems, Programming paradigms and application programming interfaces, Structure of operating system and protocol stack, Case Study: TinyOS

Applications of Sensor Networks in Science, Engineering and Societal Domain

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Holger Karl, Andreas Willig, John, Protocols and architectures for wireless sensor networks, Wiley
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, John, Wireless sensor networks, Technology, protocols, and applications, Wiley
3. Edgar H. Callaway, Wireless Sensor Networks, Architectures and Protocols, CRC Press

EC744 Broadband Network [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, the students will be able to

1. understand the importance of broadband networking services and technologies
2. describe and compare the different broadband network access techniques
3. apply concepts of OFDM, MIMO to wireless network
4. understand convergence of wireless networks

Syllabus:
OFDM & Block Based Transmissions: Block based transmissions, OFDM multiplexing systems, Single carrier cyclic prefix systems, orthogonal FDMA, interleaved FDMA, single carrier FDMA, **MIMO Antenna Systems:** MIMO system model, channel capacity, diversity and spatial multiplexing gain, SIMO & MISO systems, space-time coding, MIMO transceiver design,
UWB and Medium Access Control: Time hopping UWB, Direct sequence UWB, Multiband, other types UWB
Radio Resource Management: packet scheduling, admission control
Long-Term-Evolution Cellular Networks: network architecture, physical layer, resource management, scheduling, security
Wimax: physical layer, mesh mode, PMP mode, multi-hop relay mode
Wireless Local Area Networks: network architecture, physical layer, resource management, applications
Wireless Personal Area Networks: network architecture, physical layer, resource management, applications
Convergence of Networks: 3GPPWLAN interworking, future cellular-wimax-WLAN-WPAN interworking

Self-Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. Abdallah Shami, Martin Maier, Chadi Assi, Biswanath Mukharjee, Broadband Access Networks Technologies Deployments, Springer.
2. David Tung Choug Wong, Peng Yong Kong, Ying Chang Liang, Lee Chaing Chua, Jon W. Mark, Wireless Broadband Networks, Wiley
3. Regis J. Bud Bates, Broadband Telecommunications Handbook, Mc Graw Hill

EC714 High Performance VLSI Design [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, the students will be able to

1. understand the various components of IC Design Objectives
2. analyze effect of Technology Scaling and Interconnect network.
3. design power generators and power distribution network for IC
4. analyze / Evaluate Noise analysis for IC
5. describe and use techniques for High Speed and Low Power Design

Syllabus:

Introduction / Overview of Integrated Circuits: The MOS Transistor, Integrated Circuits, IC Design Objectives

Technology Scaling: Device Scaling, Small Geometry Effects, Device Enhancements, Interconnect Scaling and enhancements

Interconnect Networks: Interconnect Design Criteria, Interconnect passive parameters/ Components (Resistance, Capacitance, and Inductance), Signal Propagation analysis, Interconnect coupling noise, Global signaling

Power management: Power Generation: Linear regulators, Switched capacitor converters, Switched DC-DC converters, on chip converters, Power Distribution Networks

CAD & Analysis: Design flow for on chip power networks, Model RLC Impedance, characterizing load circuits, On Chip Power/ Ground Noise analysis,

Synchronization : Synchronous Systems, Characteristics, Fully Synchronized Circuits, Self timed circuits, GALS Circuits

On chip Clock Generation & Distribution: Ring Oscillators, Crystal Oscillators, Phases Locked Loop, and Delay Locked Loop, clock tree, reset circuit design and distribution

New Logic, Transistor, Models for High Speed and Low Power Design: FINFET, Carbon Nano Tubes (CNT), Techniques to reduce noise and power dissipation in VLSI Circuits

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. Emre Salman, Eby Friedman, High Performance Integrated Circuit Design, MGH
2. Neil Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Addison,Wesley
3. H. B. Bakoglu, Circuits, Interconnections, and Packaging for VLSI

EC734 RF Communication Circuits [3 0 0 3]

Course Learning Outcome:
After successful completion of the course, the students will be able to

1. understand the behavior of active and passive components at RF frequencies
2. apply the theory of electromagnetic to understand the concept of impedance matching
3. analyze microwave circuits and devices using scattering parameters
4. design basic RF circuits and evaluate RF transceiver architectures

Syllabus:
Introduction: Importance of RF circuit design, Behavior of passive component like resistors, inductors, capacitors at RF
Scattering Parameters: Definitions, measurement of S-parameters
Impedance Matching: Q factor, resonance, bandwidth, Smith Chart, matching networks using lumped elements, Quarter wave transformer, Stub matching
RF Transceiver Architectures: Receiver Front End-General Design Philosophy, Intermodulation, Third-order Intercept Point (IP3), Noise figure (NF), IIP3 of receiver front end, sensitivity, selectivity, Various RF receiver and transmitter architectures
RF Filter Design: Ideal and Approximate Filter Types, Transfer Function and Basic Filter Concepts, Filter Design issues, RF filter design, SAW filter.
Amplifier Design: Stability Considerations, Amplifier Design for Maximum Gain, Constant Gain Circles, Constant Noise Figure Circles, Low Noise Amplifier design, RF Power Amplifiers
Oscillator Design: Feedback and basic concept, RF Transistor Oscillators, Phased-Locked Loop, Frequency Synthesizers
Mixer Design: Mixer Characteristics, Switching type Mixers, Diode Mixers, FET Mixers, Other Mixers
Other RF circuits: Power combiners/dividers, directional couplers, hybrid couplers, isolators, Resonant circuits, RFIC design

Self Study:
The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. Devendra K. Misra, Radio-Frequency and Microwave Communication Circuits, John Wiley & Sons
2. Reinhold Ludwig and Pavel Bretchko, RF Circuit Design, Theory & Applications, Reinhold Ludwig and Pavel Bretchko, Pearson Education India
3. David M. Pozar, John, Microwave Engineering, Wiley
4. Thomas Lee, The Design of CMOS RF Integrated Circuits, Cambridge.
5. Kai Chang, Inder Bahl, Vijay Nair, RF and Microwave Circuit and Component Design for Wireless Systems

2EC411 : DIGITAL TELEVISION ENGINEERING

L T P C

3 - 2 4

Introduction to Television & Television Picture: Picture transmission, TV transmitter, Receiver controls, Geometric form and aspect ratio, Image continuity, No. of scanning lines, Interlaced scanning, Resolution, Brightness, Contrast.
Composite Video & Colour Signal: Video signal dimensions, Horizontal & Vertical sync details, Perception of brightness and colour, Additive and subtractive colour mixing, Video signals for colour, Luminance signal (Y), Compatibility, Colour-difference signals, encoding of colour difference signals, Formation of chrominance, PAL encoder.
Television Receiver: RF Tuner, IF Subsystem, Video amplifier, Sound section, Sync separation and processing, Deflection circuits, Scanning Currents in the yoke, DC power supplies, Chroma decoder, Separation of U and V colour phasors, Synchronous demodulators, Sub carrier generation and control, Matrixing for drive circuits.

Analog Signal Transmission and Digitization of Video Signal: Video Signal Bandwidth for Analog TV, Requirement of Digitization, Digitization formats and Transportation problem
Source Multiplexing and Scrambling: Organization of MPEG -1 multiplex-system Layer
Organization of MPEG -2 multiplex-Program and Transport system Principle of Scrambling system in DVB standards, Conditional Access Mechanism and Systems
Reception of Digital TV signal: Global View of transmission and reception process, Composition of Integrated Decoder
Evolution: state of the art and perspectives: Digital terrestrial television, Evolution of the set-top box, New architectures, High-Definition Television (HDTV), Digital TV over IP
Digital terrestrial television for mobiles,

Laboratory Work:
This shall consist of about 10 Practical based on the above syllabus.

Books:

1. Modern Television Practice by R. R. Gulati, Wiley Eastern Ltd.
2. Digital Television by Herve Benoit, Third Edition.

EC724 Image Processing [3 0 0 3]

Course learning outcomes:

After successful completion of the course, the students will be able to

1. understand the fundamentals of HVS, image formation process and color image processing
2. analyze and evaluate various spatial domain and frequency domain methods for image enhancement, filtering and mathematical operations
3. evaluate various denoising, restoration and morphological algorithms
4. apply and analyze various segmentation algorithms and object recognition algorithm for different of applications

Syllabus:

Introduction: Structure of the Human Eye, Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, image compression techniques.

Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

Filtering in the Frequency domain: 2D FT transform and its properties, 2 D convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.

Image Restoration algorithms: Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

Color Image Processing: Color Fundamentals Color Models Pseudo color Image Processing Basics of Full-Color Image Processing Color Transformations Smoothing and Sharpening Color Segmentation in HSI Color Space Segmentation in RGB Vector Space Color Edge Detection Noise in Color Images Color Image Compression

Morphological Image Processing: Basics of SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

Image Segmentation: Detection of Discontinuities, Point Detection, Line Detection, Edge Detection, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds, The Use of Motion in Segmentation, Spatial Techniques, Frequency Domain Techniques

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. R. C. Gonzalez, R. E. Woods, Digital Image Processing, Addison Wesley
   A. K. Jain, Fundamentals of digital Image Processing, Prentice-Hall
2. K. R. Castleman, Digital Image Processing, Pearson Education India
3. Sridhar, Digital Image Processing, Oxford Univ. press
4. Vipula Singh Digital Image Processing with MATLAB and LabView:, Elsevier
5. Dr. S. Jayaraman, S.Esakkirajan, T.Veerakumar, Digital Image Processing, TMH

CH001 Air Pollution Control Engineering [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

1. understand the fundamentals of air pollution, the major collection mechanism and equipments/instruments for a given gaseous or particulate pollutants
2. select and apply the most appropriate air pollution control system
3. understand the fundamentals of indoor and odour pollution
4. understand different methods for controlling emissions from stationary and mobile sources
5. apply the concept of air pollution control engineering to the professional society and general public

Syllabus:

Introduction to Air Pollution : Air pollution in India and the world, sources and classification of air pollutants, global concern of air pollutants, effects of air pollutants.
Meteorological Aspects of Air Pollution: Temperature lapse rates and stability, meteorological factors influencing air pollution, plume behavior, dispersion of air pollutants and estimation of plume rise.
Sampling and Measurement of Air Pollution: Types of pollutant sampling and measurement, ambient air sampling, stack sampling, analysis of air pollutants.
Source Correction Methods: Raw material change, process change, equipment modifications.
Particulate Control Techniques: Collection efficiency, particulate control equipments like gravity settling chambers, cyclone separator, filters, electrostatic precipitator, wet scrubbers.
Control Technologies for Gaseous pollutants: Scrubbers, absorption and adsorption, control of specific gaseous pollutants like SO_x, NO_x.
Control of Volatile Organic Compounds: Environmental significance of organic compounds and its control.
Odor and Its Control Techniques: Sources and characteristics of odor, measurement and control of odor.
Indoor Air Pollution: Indoor air pollutants and its effect, factor influencing indoor air quality, control of indoor air pollutants.
Air Pollution Legislation and Regulations: Air quality criteria and emission standards.
Control of Air Pollutants from Various Sources like Stationary and Mobile source
Recent Trends in Air Pollution Control Techniques

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Richard W. Bouble, Donald L. Fox, D. Bruce Turner, Arthur C. Stern, Fundamentals of Air Pollution, Academic Press.
2. C. S. Rao, Environmental Pollution Control Engineering, New Age International.
3. M N Rao, H V N Rao, Air Pollution, Tata McGraw Hill.
4. J. R. Mudakavi, Principles and Practices of Air Pollution Control and Analysis, I. K. International.
5. S. C. Bhatia, Textbook of Air Pollution and its Control, Atlantic Publishers & Distributors.
6. R. K. Trivedy, P. K. Goel, An Introduction to Air Pollution, BS Publications.

L	T	P	C
2	0	2	3

Course Code	CE002
Course Title	Internet and Web Technologies

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

1. understand the architecture of web based applications and underlying technologies
2. design an efficient web based applications using appropriate web technologies
3. develop web based application using appropriate scripting languages

Syllabus:

Teaching Hours:

Unit I

Internet Structure, Protocols and Access: Internet Protocol Model overview, Internet Addresses, Internet Protocol, Transport Layer, Upper layer Protocols, Internet Access, Internet Applications, About World Wide Web ,Future of Internet and Internet related applications WWW and Web Servers, IIS Configurations and settings, Apache Configuration, Introduction to PWS, Planning a Website. XHTML: Introduction, Forms, Internal Linking, Image Maps, meta, frameset — 7

Unit II

Cascaded Style Sheet: Inline styles, Embedded Style Sheets, Linking Style Sheets, Text Flow and Box Model. JavaScript: Introduction, Control Structures, Functions, Arrays, Objects. — 8

Unit III

Dynamic HTML: Object Model and Collection, Event Model, Filters and Transitions, Data binding and Tabular Data Control. XML: XML namespaces, DTDs and schemas, DOM , SAX, XSL, SOAP. — 5

Unit IV

ASP: Introduction, ASP Objects, FSO, Data Access Object. Building Interactive Animation: Working with Flash and Dream Weaver — 6

Unit V

Wireless Internet and m-business: Introduction to Wireless Internet, WAP, m-business. e- business and e-commerce. E- Business Models, Building an e-business Application, e-marketing, Security — 4

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

1. Deitel Deitel Nieto, Internet and World Wide Web: How to Program, Pearson Education
2. Minoli, Internet and Intranet Engineering, McGraw Hill Education

L= Lecture, T= Tutorial, P= Practical, C= Credit
^This is not an exhaustive list

L	T	P	C
2	0	2	3

Course Code	CE003
Course Title	Data Structures

Course Learning Outcome (CLO):

At the end of the course, students will be able to -

1. understand various data structures and applications associated with them
2. analyse efficiency and effectiveness of various data structures
3. apply appropriate data structures for time and space optimization

Syllabus:

Teaching Hours:

Unit I

Introduction to Data Structures: Types of Data Structures, Linear & non-linear Data Structures. Linear Data Structures & their sequential storage representation: Storage Structures for arrays, stack definitions & concepts, operations on stacks, double stack, applications of Stacks-Recursion, Polish Expressions and their compilation, Queue-Representation of queue, operations on queue, priority queues, linked list-linked linear list-operation on linear list using singly linked storage structures, circularly linked list, doubly linked linear list, applications of linked linear list-polynomial manipulation. — 10

Unit II

Non Linear Data Structures: Trees-Definitions and concepts, operations on Binary Trees, Storage Representation and Manipulation of Binary Trees-Linked & Threaded, Conversion Of General Trees To Binary Trees, Sequential and other representations of trees, applications of Trees-the Manipulation of Arithmetic Expressions, Multi Linked Structures-Sparse Matrices. — 6

Unit III

Graphs-Matrix: Graphs-Matrix representation of graphs, Breadth First Search, Depth First Search, Spanning Trees. Searching: Searching-Sequential & Binary Searching, Search Trees-Height Balanced, Weight Balance, 2-3 Trees, Tree Structures — 5

Unit IV

Sorting: Sorting-Notation and Concepts, Time and Space Complexity, Asymptotic behavior, Sorting: Insertion Sort, Selection Sort, Bubble Sort, Merge Sort, Tree Sort, Quick Sort, Shell Sort, Radix Sort, Address Calculation Sort, Summary of Sorting — 4

Unit V

Hashing: Hash Table Methods-Introduction, Hashing Functions, and Collision-Resolution Techniques. File Structure: Definition of Record, File, Blocking, Compaction and Database, introductory overview of Database Management System, Implementation and — 5

Traders of Sequential Access, Index Sequential Access, Random Access, B-Trees, Inverted List and Multi list.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill Edition

L= Lecture, T= Tutorial, P= Practical, C= Credit
^This is not an exhaustive list

CL002 Project Management [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

1. understand project, management functions, planning, monitoring and controlling techniques
2. develop network, calculate project duration and optimize time and cost
3. implement resource allocation and control techniques
4. identify, analyze and apply suitable planning and management techniques for project management

Syllabus

Introduction to Management: History, concept, need for scientific management, scope, functions, engineer as manager.

Organizational Structure: Need, types, principle, functions of various personnel, organization as resource.

Material Management: Objectives, scope, functions, stages of material management, inventory control.

Personnel Management: Special characteristics, man power planning, recruitment, placement, training and induction, motivation, performance appraisal, industrial relation, aspect of administration, motivation, public relation, welfare measures.

Project Planning and Control: Project life cycle, identification, budget planning, appraisal, negotiation, approval, detailed planning, implementation, monitoring and control, evaluation, planning techniques and their merits and demerits.

Network Analysis: History, Bar chart, CPM and PERT: development of network, time estimates and computation, analysis of network, time-cost trade off, updating and resource allocation.

Accounting and Financial Management: Accounting: Concept, objectives, types, principles. Finance Management: Finance as resource, functions, control, cost analysis. Financial statements: Balance sheet, profit and loss account, fund and cash flow statement. Financial Analysis**:** Financial ratio, types, significance Methods, factors, purpose, financial analysis, cost-benefit ratio. C-V-P analysis: concept, assumption, fixed and variable cost, breakeven point, margin of safety, utility.

Project Information System: Need, components, use of computer, implementation, monitoring, reports, schedule and budget, updating, cost and time control.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Nagarajan, Project Management, New Age International Publishers
2. Harold Kerzner, Project Management: A System Approach to Planning, Scheduling and Controlling, John Wiley and Sons
3. Burke and Rory, Project Management: Planning and Control Techniques, John Wiley and Sons
4. Prasanna Chandra, Financial Management: Theory and Practice, Tata McGraw Hill

5. P Gopalakrishnan, Materials Management, Prentice Hall
6. K. Aswathappa, Human Resource Management: Text and Cases, Tata McGraw Hill

EE002 Electrical Power Utilization and Safety [3 0 0 3]

Course Learning Outcome:

After successful completion of this course, students will be able to

1. understand the importance of power factor and suggest a suitable method for improving it
2. suggest and apply suitable electric heating, welding, refrigeration and air conditioning for a system
3. analyze and design illumination scheme, electrification, earthing system and protection system for an application

Syllabus:

Electric Heating and Electric Welding: Advantages of electric heating, Resistance heating, Types of furnaces, Induction heating, Types of induction furnaces, Dielectric heating, Types of welding- arc and resistance.

Refrigeration and Air conditioning: Introduction to refrigeration and air-conditioning, Principles of a refrigerator, Domestic refrigerator, Electrical circuit of refrigerator, Need of voltage regulator, Water cooler, Air conditioner, Thermo-electric refrigeration, Air purification, Central air conditioning systems.

Illumination Scheme: Basic terms used in illumination scheme, Electric lamps, Recommended levels of illumination, Types of lighting schemes, Design of lighting schemes, Factory lighting, Street lighting, Flood lighting.

Electrical Installation, Estimating and Costing: Types of load, Load assessment, Electrical supply systems, Wiring systems, Permissible voltage drops and conductor size calculations, Estimating and costing for residential and commercial service connections (single phase and three phase).

Power Factor: Effects of power factor, Causes of low power factor, Disadvantages of low power factor, Methods of improving power factor.

Electrical Safety Concepts and Criteria: Electrical shock mechanisms, Factors influencing the electric shock, Body current thresholds (tolerable body current limit), Thevenin's concepts and accidental equivalent circuits (step and touch potentials), Protection against electric shock.

Earthing Systems: Purpose of earthing, IS rules for earthing of electrical installations, Factors governing the resistance of earth electrode, Methods of earthing, Measurement of earth resistance, Methods of reducing earth resistance.

Protective Devices: Fuse, Miniature circuit breakers (MCB) and Earth leakage circuit breakers (ELCB).

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References:

1. E. Openshaw Taylor, Utilisation of Electrical Energy, Universities Press.
2. H. Partab, Art and Science of Utilisation of Electrical Energy, DhanpatRai& Co.
3. J. B. Gupta, Utilization of Electric Power and Electric Traction, S. K. Kataria& Sons, New

Delhi.
4. G. C. Garg, Utilization of Electric Power and Electric Traction, Khanna Publishers, Delhi.
5. R. K. Rajput, Utilisation of Electrical Power, Laxmi Publications (P) Ltd., New Delhi.
6. N. V. Suyranarayana, Utilisation of Electric Power Including Electric Drives and Electric Traction, New Age Publishers, New Delhi.
7. J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S. K. Kataria& Sons, New Delhi.
8. Dr. J. G. Jamnani, Elements of Electrical Design, Mahajan Publishing House.

IC004 Microcontroller and its Applications [3 0 0 3]

Course Learning Outcome:

After successful completion of the course, student will be able to

1. understand the basic working of microcontrollers
2. program the 89CXX controller in C and assembly language
3. interface and analyze the 89CXX based circuits
4. design and develop systems based on 89CXX microcontrollers

Syllabus:

Architecture of 89CXX series microcontroller: Micro controller Hardware, Input /Output Pins, Ports and Circuits, External Memory, Counter and Timers, Serial Data Input/Output, Interrupts, Basic Assembly Language Programming Concepts

Data Transfer Operations: Addressing Modes, External Memory Read-Only Data Moves, Push and Pop Opcodes, Data Exchanges

Arithmetic & Logical Operations: Flags, Incrementing and Decrementing, addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Byte-Level Logical Operations, Bit-Level Logical Operations, Rotate and Swap Operations

Jump and Call Instructions: Jump and Call Program Range, Jump, Calls and Subroutines, Interrupts and Returns, More Details on Interrupts

C Programming for microcontroller: Data types and time delay in 89CXX Controller, I/O programming, Logic operations, Data conversion programs, Accessing code in ROM space, Data serialization.

The Microcontroller Based Design: A Microcontroller Design, Testing the Design, Timing Subroutines, Lookup Tables for the 8051, Serial Data Transmission Applications Keyboards, Displays, Pulse Measurement, D/A and A/D Conversions, Multiple Interrupts Serial Data Communication Network Configurations, Data Communication Modes

Applications of Microcontroller: Stepper motor control, PMDC motor speed control, RTC interfacing, Relays and alarms interfacing with microcontroller, frequency calculation, pulse width calculation, temperature indication using microcontroller

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study

References:

1. K.J.Ayala, The 8051 Micro controller, Architecture, Programming and Applications, , Penram International Publication.
2. Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, 8051 Microcontroller and Embedded Systems , Pearson Higher Education Publication.
3. Myke Predko, Programming and Customizing the 8051 Microcontroller, McGraw-Hill Publication.

L	T	P	C
3	0	0	3

Course Code	HS001
Course Title	Entrepreneurship Development

Course Outcomes (CO):

At the end of the course, students will be able to-

1. understand and formulate entrepreneurship process
2. analyze financial and marketing feasibilities
3. evaluate business models

Syllabus: Teaching Hours :45

Unit I **8**

Basic Entreprenurial Concepts: Entrepreneurship: Definition and structure. Entrepreneurial culture, the concept of Entrepreneurship. Entrepreneurial Traits: Entrepreneurial Skills, Qualities and Characteristics of an Entrepreneur, Nature and Importance of entrepreneurs. Entrepreneurship as a career choice. Contribution of entrepreneurs to the Development of the Nation.

Unit II **8**

Entrepreneurship Development: entrepreneurial Environment, Meaning and Process of entrepreneurial Development. Entrepreneurial Development Training, Importance, Objectives and Methods of Training.

Unit III **8**

Project Management: Search for Business Idea, Concept of Project and classification. Project Identification and Formulation. Project Design & Network Analysis. Project Report, Project Appraisal.

Unit IV **8**

Financial Analysis: Investment Process, Break even analysis, Budget and Planning Process Sources of Development Finance, Financial Institutions.

Unit V **8**

Establishing Small Scale Industry: Location, Steps of Setting up a Small Scale Industry, Selection of Organization.

Unit VI **5**

Marketing Environment: Marketing Segmentation, Market Research, Market Planning.

Self-Study :

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self -study contents.

Suggested Readings ^ :

1. Desai Vasant, Dynamics of Entrepreneurial Development and Management.Himalaya Publishing House
2. Sankar Raj, Essentials of Entrepreneurship Tata McGraw Hill Pvt. Ltd.

L = Lecture, T = Tutorial, P = Practical, C = Credit

^ this is not an exhaustive list

ME001 Robotic Engineering [3 0 0 3]

Course Learning Outcome:

1. After successful completion of the course, student will be able to
2. apply the concept of robotics to select the type of manipulator best suitable to the application
3. formulate the mathematical relations for kinematic analysis of robotic manipulator.
4. integrate the structural design, actuator selections, drive system, sensor and control system necessary to implement a robot in a specific job task

Syllabus:

Robot technology:

Fundamentals of Robots: Introduction, fundamentals of robot technology, classification, applications, Systems overview of a robot, basic components, control system and components

Robot motion analysis and control:

Robot arm kinematics, Forward & inverse kinematics solutions, Trajectory design.

Langrange-Euler formulation, Newton-Euler formulation, Generalized D'Alembert equation of motion, robot arm dynamics.

Actuators and sensors in Robot- AC/DC motors, stepper motors and servo motor, direct drive robot, Hydraulic and pneumatic systems.

Internal sensors, Position, Velocity, Acceleration, Proximity sensors, Touch and Slip sensors, Force and Torque sensors, External sensors, contact and non contact type like Vision, ranging, laser, acoustic, tactile etc. sensor selection and control.

Robot programming & languages.

Types of End Effectors and Design
End effectors , Classification , Force analysis and Gripper design.

Introduction to Mobile robots, Robot Intelligence and Task Planning, Modern Robots, Future Application and Challenges.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. Richard D. Klafter, Thomas A Chmielewski and Michael Negin, Robotics Engineering: An integrated approach, Prentice Hall
2. Mittal and Nagrath , Robotics & Control , Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. John Craig , Introduction to Robotics, mechanics and control, Pearson Education, New Delhi
4. M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas Godfrey, Industrial Robotics. Tata McGraw Hill Education Pvt. Ltd
5. Ashitava Ghoshal, Robotics Fundamental Concepts & Analysis, Oxford University Press.

ME011 RENEWABLE ENERGY SOURCES [3 - - 3]

Course Learning Outcome:

After successful completion of the course, student will be able

1. To understand the importance of Renewable Energy Sources in the present era.
2. To describe various methods for power generation by using different type of Non-conventional and renewable energy sources.
3. To apply the knowledge of converting energy resources like solar, wind , biomass, tidal, wave, ocean thermal, and geothermal energy for power generation.
4. To understand the working and applications of fuel cells and usage of bio-fuels.

Syllabus:

Energy scenario of India and World, Need of Renewable Energy sources

Solar energy, extra-terrestrial and terrestrial radiations, radiation geometry, variation of insolation and its measurement, computation of solar radiation on horizontal and tilted surfaces, solar flat plate collectors, their configuration, material of construction and general characteristics, concentrating collectors, receiver systems, heliostat, optical losses, types of solar energy storage, solar energy applications.

Wind energy, analysis of wind speeds, different types of wind turbines, use of meteorological data for site selection, materials of construction, performance characteristics, and applications

Biomass, energy plantation, biomass gasifiers, types, construction of biogas plants, scope and future

Tidal, wave and ocean thermal energy conversion plants, geothermal plants, small hydro plants, magneto hydrodynamic plants, fuel cells, use of non-conventional fuels, bio fuels and their applications

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Reference Books:

1. Non-conventional Energy Sources by G.D.Rai, Khanna Publishers
2. Renewable Energy Resources by John Twidell and Tony Weir, Taylor and Francis
3. Solar Energy Utilization by G.D.Rai, Khanna Publishers

Solar Energy by S P Sukhatme, Tata McGraw Hill Education Private Limited

EC801 Major Project [0 0 30 24]

Course Learning Outcome:

After successful completion of the course, student will be able to

1. use various tools and techniques to study existing systems
2. critically analyse existing systems, thereby select and justify parameters to be improved
3. start and manipulate proposed engineering solution as per industry / research / societal need
4. achieve precision in uses of the tools related to their experiments/fabrication
5. reorganize and refine various components of technology to optimize the resources at large
6. appraise the potential of technology for scalability and wide spectrum of applications
7. report project related activities effectively to peers, mentors and society
8. follow and value health, safety and ethical practices during project

Syllabus:

The major project shall be based on the recent trends in technology, system/process analysis, construction/fabrication/production techniques, design methodologies etc. The student(s) shall carry out a comprehensive project at relevant Academic/R&D/Industrial organisation based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit comprehensive project report based on the work.

2EC407 COMPREHENSIVE VIVA/VOCE **L** **T** **P** **C**

- - - 2

Each student will prepare for the subjects studied in the previous semesters and present it. The comprehensive presentation consists of the fundamentals of the subjects, their relevance in further study presentation consists of the fundamentals of the subjects, their relevance in further study and in industry.

University Elective Course (Institute of Architecture and Planning)

L	T	P	C
1	-	3	3

Course Code	**UEIA001**
Course Title	**GIS AND REMOTE SENSING**

Course Learning Outcomes (CLO):

At the end of the course Students will be able to -

- Develop understanding about database management.
- Display data in maps.
- Acquire fundamental knowledge of Remote Sensing through Satellite imageries.
- Gain insights on application of GIS and Remote Sensing in Planning.

Teaching hours: 60

Syllabus:

Unit 1: Database Management and Data Analysis Hours: 12

- Fundamental concpets of Database Management System
- Query Building
- Understanding the usage of ArcTool Box
- Creating Charts and graphs
- Statistics Summary
- Using Field Calculator
- Calculate Geometry
- Buffering or Proximity Analysis
- Overlay Analysis
- 3D, spatial and statistical analysis
- Land Matrix
- Land Utilization
- Cloud Computing
- Crowd Sourcing

Unit 2: Displaying Data in Maps and Map Elements Hours: 16

- Symbology
- Labeling and Annotation
- Creating Map Layout
- Inserting Map Scale; Legend Map; Title; North Symbol; Creating Grids; Other map Elements and Saving a Layout.

- Conducting a Land Suitability Analysis using GIS, Introduction to new concepts like cloud computing, crowdsourcing etc.

Unit 3: Remote Sensing and Photo Interpretation Hours: 16

- Remote Sensing -Definition, Aerial and Satellite Remote Sensing; Aerial Photo-Interpretation, Qualitative and Quantitative Elements of Photo- Interpretation
- Satellite Remote sensing, Geo-Stationary and Sun-Synchronous Satellites, Principles of Electro-Magnetic Radiations, Resolutions
- Introduction to Digital Image Processing
- Salient Features of Popular Remote Sensing Satellites; Applications in Planning
- Laboratory Exercises

Unit 4: Photogrammetry Hours: 08

- Limitations of Traditional Surveys for Planning
- Photogrammetry as an Alternative Tool for Surveying
- Arial Photographs, Classification
- Principles of Stereoscopic Vision
- Basic instruments -Stereopair, Pocket and Mirror Stereoscopes, Parallax Bars
- Principles of Photogrammetry, Measurement of Heights and Depths
- Introduction to Digital Photogrammetry

Unit 5: Planning Information Systems in India Hours: 08

- Introduction to Spatial Data Infrastructure, NNRMS, NUIS, National Urban Observatory, Municipal Information Systems, Land Information Systems, Cadastre Systems
- Applications and Limitations
- Tools for Spatial Data Handling,
- BHUVAN
- Agencies responsible for generating spatial data.

Suggested Readings:

- "National Atlas and Thematic Mapping Organisation" (NATMO) Publications
- Andrew Skidmore et al, "*Environmental Modelling with GIS and Remote Sensing*", CRC Press
- Basdudeb Bhatta, "*Remote Sensing and GIS*", Oxford University Press
- David J Maguire et al, "*GIS, Spatial Analysis, and Modelling*", ESRI Press
- Mesfin T Bekalo et al, "*Landuse Change Detection using GIS, Remote Sensing and Spatial Matrices*", Lap Lambert Academic Publications
- Mezenzia Mengist, Vdm Verlag, "*Lans Sustainability Evaluation using GIS and Remote Sensing Technology*",
- Netzband, "*Applied Remote Sensing in Urban Planning, Governance and Sustainability*", Springer, India
- PA Longley et al, "*Geographic Information Systems and Science*", John Wiley and Sons Ltd.
- Qihao Weng, "*Remote Sensing and GIS Integration: Theories, Methods and Applications*", McGraw Hill Professional
- Satheesh Gopi, "*Advanced Surveying: Total Station, GIS and Remote Sensing*", Pearson
- Thomas M Lillesand et al, "*Remote Sensing and Image Interpretation*", John Wiley and Sons Ltd.

NIRMA UNIVERSITY
INSTITUTE OF LAW
Academic Year: 2016-17
University Elective
Introduction to the Indian Constitution

Credit: 3
Hours: 45

L	T	PW	C
3	-	-	3

Introduction:

India is a democracy and her Constitution seeks to establish its fundamental organs of government and administration, describe their structure, composition, powers and principal functions, define democracy through relationship of the organs with one another and with the people. The Constitution also guarantees certain Fundamental Rights to its citizens that are not to be infringed by the Government. A good understanding of the Constitution and the law, which has developed through constitutional amendments, judicial decisions, constitutional practice and conventions is, therefore, absolutely necessary for a student of law.

The purpose of teaching constitutional law is to highlight its never-ending growth. Constitutional interpretation is bound to be influenced by one's social, economic or political predilections. A student must, therefore, learn how various interpretations of the constitution are possible and why a significant interpretation was adopted in a particular situation. Such a critical approach is necessary requirement in the study of Constitutional law.

Course Learning Outcomes:

After the completion of the course the students will be able:

1. To understand the nature, scope and extent of the Fundamental rights
2. To understand the Composition, Role and Functions of Executive, Legislature and Judiciary.
3. To analyze and critic the interrelationship between the different organs of the Government i.e. Executive, Legislature and Judiciary.
4. To apply the knowledge of the constitutional provisions in solving the emerging challenges posed to the constitution.

Unit I: Introduction to Indian Legal System

- Constitution, Constitutionalism, Constitutional Law, Constitutional Conventions

-2-

- Historical evolution of the Constitution of India during British Raj
- Formation of Constituent Assembly
- Working of Constituent Assembly
- Salient Features of Indian Constitution

Unit II: Goal, Values, Ideals & Aspirations from the Constitution

- Objectives Resolution
- Preamble to Indian Constitution
- 42nd Amendment Act & the Preamble

Unit III: Nature of Indian Union

- Indian Union
- Formation, Creation and Establishment of new States under the Union
- Citizenship

Unit IV: Fundamental Rights

- Definition of State
- Definition of Law
- Right to Equality
- Fundamental Freedoms
- Right to Life & Personal Liberty
- Right against Exploitation
- Right to Religion
- Right to Constitutional Remedies

Unit V: Organs of the Government

- Union Executive
- Union Parliament
- Union Judiciary

Unit VI: Emergency Provisions

- National Emergency
- State Emergency
- Financial Emergency

Unit VII: Amendment to the Constitution

- Need for Amendment
- Types of Amendment
- Procedure for Amendment

Unit VIII: Constitutional Bodies

- Comptroller & Auditor General of India

- Finance Commission of India
- Election Commission of India

Unit IX: Panchayat Raj Institutions

- Committees
- 73rd & 74th Amendment Act
- Rural Local Bodies
- Urban Local Bodies
- PESA Act

Text Book:

1. M. P. Jain, Constitutional Law, 6th Edition Lexis Nexis Butterworths.
2. V. N. Shukla's, Constitution of India, 12th Edition, Eastern Book Company
3. J.N. Pandey, The Constitutional Law of India, 50th Edition, Central Law Agency

Reference:

1. H.M. Seervai, Constitutional Law of India (4th ed., Vol 1 (1991), Vol.2 (1993), Vol.3 (1996)
2. D.D. Basu, Shorter Constitution of India (14th ed., 2009)
3. V.D. Sebastian, Indian Federalism the Legislative Conflicts (1985).
4. B. Shiva Rao, The Framing of India's Constitution – Select Documents (1967)
5. Granville Austin, Indian Constitution: Corner stone of the nation (1966)
6. Granville Austin, Working a Democratic Constitution - A History of the Indian Experience (1999)

Appendix-A
(Item No. ... AC mtg. - 17.4.(?))

NIRMA UNIVERSITY
INSTITUTE OF LAW
University Elective Course
Academic Year 2017-18

L	T	PW	C
3	-	-	3

Course Code	
Course Title	Intellectual Property Rights

Course Learning Outcomes:

At the end of this course the student will able to:

1. Understand on various facets of IPR including Trade Mark, Patent, Copyright and Design Law
2. Identify various issues and challenges related to IPR.

Syllabus **Teaching Hours: 45**

Unit 1 Introduction **6 Hours**

1.1 Concept of Property
1.2 Concept of Intellectual Property
1.3 Various Justification of Property
1.4 Introduction to TRIPS Agreement

Unit 2 Patent Law **9 Hours**
2.1 Concept and basis of protection
2.2 Criteria of Patentability
2.3 Novelty, Utility and Non-obviousness
2.4 Non Patentable Inventions
2.5 Procedure for patent registration
2.6 Rights of Patentee and Infringement procedure
2.7 Green Patents
2.8 Leverage of Patents

Unit 3 Copyrights Law **8 Hours**
3.1 Introduction and justification
3.2 Subject-Matter of Copyright
3.3 Literary, Dramatic, Musical, Artistic, Cinematograph Films and Sound Recordings
3.4 Copyright and related rights
3.5 Fair use

1

3.6 Rights covered under copyright & remedies for infringement

Unit 4 Trademarks Law **8 Hours**

4.1 Concept and justification of trademarks protection

4.2 Types of marks - Distinctiveness, Descriptive marks, Generic marks and Well-Known Trademarks

4.3 Grounds of Refusal of Registration

4.4 Procedure for Registration

4.5 Rights of trademark owner and Infringement – passing off of trademarks

4.6 Trademarks and Geographical indication

Unit 5. Design Law **8 Hours**

5.1 Basics of Design & Justifications for protecting designs

5.2 Features of Shape, Configuration, Pattern, or Ornament or Composition of Lines or Colour

5.3 Excluded Subject-Matter

5.4 Rights of Design owner and protection against Infringements

Unit 6. Traditional Knowledge and Biodiversity **6 Hours**

6.1. Concept of Traditional knowledge

6.2 Bio-piracy and bio-prospecting

6.3 Access and benefit sharing under CBD

Suggested Readings:

- Ahuja V K. Intellectual Property Rights. Lexis Nexis- Butterworths, New Delhi. 2015
- B.L. Wadhera. Law on Intellectual Property Rights. Universal Publication, 2014
- Cornish, W R. Cases and Materials on Intellectual Property, 3rd Ed. London: Sweet & Maxwell, 1999.
- Verkey Elizabeth, Law of Patents, Second Edition, Eastern Book Company, Lucknow, 2012

UEIM006 Human Resource Management

Course Title: Human Resource Management

Course Code: UEIM006

Credit Hours: 3

Course Learning Outcomes

By the end of the course, the students would be able to:

1. Describe roles and responsibilities of the HRM function
2. Identify different systems within HRM viz. Recruitment and Selection, Performance Management, Compensation Management, Employee Relationship Management and recognize their strategic contribution to business and organizations;
3. Distinguish between people management role of HR and non-HR specialist in organizations

Syllabus

Module I: Introduction

- An Introduction to Human Resource Management
- Skills and Competencies of a Human Resource Manager
- Corporate Strategy and Human Resource Management

Module II: Manpower Planning and Talent Acquisition

- Manpower Planning and Deployment
- Job Analysis, Design and Redesign of Jobs
- Recruitment & Selection

Module III: Managing and Rewarding Employee Performance

- Performance Management
- Compensation Management
- Learning & Development

Module IV: Managing Employee Relations

- Employee Relationship Management
- Industrial Disputes & Conflicts
- Labour Legislation
- Managing Employee Exit and Separations

Module V: Contemporary issues in Human Resource Management

Suggested Reading:

- Dessler, G. Varkkey, B. (2011. Human Resource Management. (12th Edition). New Delhi: Pearson Education.
- Bernardin, J. H. (2007). Human Resource Management – An Experiential Approach. New Delhi: Tata McGraw Hill Publishing Company Limited.
- Singh B.D. (2004). Industrial Relations, Emerging Paradigms. New Delhi: Excel Books.
- Varkkey, B., Dutta, R. and Rao, G. P. (Eds). (2000). Value Creation: The Challenge of HR in the New Millennium. New Delhi: Tata McGraw-Hill Publishing Company Limited.
- Ramaswamy, E.A. (2000). Managing Human Resources: A Contemporary Text.
- New Delhi: Oxford University Press.
- Pande, S. and Basak, S. (2012). Human Resource Management. (1st Edition). New Delhi: Pearson Education.

UEIM007 Fundamentals of Financial Management

Course Title: Fundamentals of Financial Management

Credit Hours: 4.0

Course Objectives

1. To provide students with the basic understanding of financial management in an organizational context
2. To help them understand the working of financial markets
3. To enable them to use spreadsheets to perform financial analysis

Learning Outcomes

At the end of the course, students shall be able to:

1. Understand the significance of financial management to firm performance
2. Identify the variables important to making financial decisions
3. Perform primary investment decision analysis
4. Describe sources of funds and their costs
5. Perform basic financial analysis using spreadsheets

Syllabus

Module 1: Basics of Financial Management

1. Introduction to Financial Management
2. Role and Functions of the Finance function
3. Time Value of Money
4. Basics of Risk and Return

Module 2: Financial Markets and Instruments

1. The Financial System
2. Introduction to Financial Markets and Instruments
3. Sources and Cost of Capital

Module 3: Major Financial Decisions

1. The Investment Decision
2. The Funding Decision
3. The Distribution of Profit Decision
4. Introduction to Working Capital Management
5. Managing Risk

Module 4: Using Spreadsheets in Finance

1. Introduction to Financial functions in Spreadsheets
2. Spreadsheet Application Exercises

Suggested Readings

1. Chandra, P. (2010). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.
2. Khan, M. Y. & Jain, P. K. (2012). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.
3. Pandey, I. M. (2011). Essentials of Financial Management. New Delhi: Vikas Publishing House.
4. Ross, S., Westerfield, R. & Jordan, B. (2012). Fundamentals of Corporate Finance. New Delhi: Tata McGraw Hill.
5. Rustagi, R. P. (2011). Financial Management: Problems & Solutions. New Delhi: Taxmann.
6. Wachowicz J. M. & Van Horne, J. C. (2009). Fundamentals of Financial Management. New Delhi: PHI Learning

UEIM001 Indian Economy

Course Title: Indian Economy
Credit Hours: 3
Course Number: UEIM001
Course Objectives

2. To introduce the students to the various dimensions of the Indian Economy
3. To provide a historical and current analysis of how the Indian Economy has reached its current state of affairs

Learning Outcomes
At the end of the course, students shall be able to:
1. Understand the various aspects of India's economy
2. Develop a perspective on the different problems and approaches to economic planning and development in India
3. Understand the role of the Indian Economy in the global context, and how different factors have affected this process

Syllabus

Module 1: STRUCTURE OF THE INDIAN ECONOMY

a. India As A Developing Economy; Indian Economy On The Eve Of Independence; National Income Of India: Trends And Levels
b. Human Resources And Economic Development; Human Development In India; Occupational Structure And Economic Development
c. Natural Resources, Economic Development And Environmental Degradation
d. Infrastructure In The Indian Economy; Social Infrastructure And Social Sector

Module 2: PLANNING AND ECONOMIC DEVELOPMENT

e. Objectives And Strategy Of Economic Planning In India;
f. Approach To The Ongoing Five Year Plan
g. Regional Planning In India
h. Financing Of The Plans
i. Economic Reforms In India – Main Features And Achievements

Module 3: DOMESTIC SECTOR

j. Institutional And Technological Reforms In Indian Agriculture
k. Agricultural Finance And Marketing
l. Agricultural Prices And Policy
m. Industrial Policy
n. Sources Of Industrial Finance; Role Of Small Scale And Cottage Industries In Indian Economy.

Module 4: EXTERNAL SECTOR OF THE ECONOMY

a. India's Balance Of Payments – Problems And Solutions
b. Trends, Composition And Direction Of India's Foreign Trade
c. New Trade Policy
d. WTO And Indian Economy
e. Foreign Investment Inflows

f. India's Exchange Rate Policy

Module 5: ISSUES AND CHALLENGES OF INDIAN ECONOMY

a. Problems Of Poverty
b. Inequality
c. Unemployment And Inflation - Strategy And Policy Of The Government
d. Food Security And Public Distribution System
e. Salient Features Of The Relevant Union Budget

Suggested Readings

1. Datt, R and Sundharam, K.P.M. Indian Economy. New Delhi: S. Chand & Company Ltd. (Latest Edition).
2. Jalan, B. The Indian Economy: Problems and Prospects. Penguin Books.
3. Misra, S.K. and Puri, V.K. Indian Economy. Himalaya Publishing House.
4. Agrawal, A.N. Indian Economy: Problems of Development and Planning. New Age International Publishers.
5. Economic Survey. Government of India (Latest Issue).
6. Relevant Business Newspapers.

UEIP001 COSMETIC TECHNOLOGY

COURSE NAME: COSMETIC TECHNOLOGY

Learning Outcomes:

After successful completion of the course student will be able to :

1. Acquire comprehensive knowledge about the various raw materials used in cosmetic formulations
2. Create and develop cosmetic formulations
3. Analyze the cosmetic formulations for evaluating its efficacy and safety
4. Understand the regulatory guidelines related to cosmetic formulations

Theory (Detailed Syllabus)

L P C 3 - 3

1. Introduction: The scope, historical background and present status of herbal cosmetics.

2. Classification of Cosmetics.

3. Raw materials used for formulation of skin care and hair care cosmetics: Source and description of raw materials of natural origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulations.

4. Formulation and analysis of cosmetics: hair care, skin care and oral care products.

5. In vitro and in vivo models for efficacy testing for various cosmetic products.

6. Regulatory guidelines:

Complaince of Drug & Cosmetic Act 1940 with reference to provisions for packaging and labelling (Rule 150 A, schedule S), permitted colors, flavors etc.

BIS guidelines for cosmetic products and raw materials.

Total Lectures: 45

Books Recommended:

1. Sagarin Edward, Cosmetic Science and Technology Vol. I, II, III , Wiley India Pvt. Ltd., Canada, 1992

2. Sharma P.P., Cosmetic Formulation, Management and Quality Control, Vandana Publications Pvt. Ltd., Vandana Publications, Delhi, 2010

3. Paye M, Barel A.O., Maibach H.I., Handbook of Cosmetic Sciences, Informa Press, Tylor and Fransis, LLC, 2006

4. Panda H., Herbal Cosmetics Handbook, Asia pacific Business press, 2004
5. Veermeer B.J., Cosmeceuticals: Drugs vs. Cosmetics, Marcel Dekker, Editors: Peter Elsener, Howard I. Maibach, Marcel Dekker Inc., New York, 2000.

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3	-	-	3

Course Code	**UEIP007**
Course Title	**Advanced Instrumental Techniques**

Scope:

This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives:

Upon completion of the course, the student shall be able to-

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. Recall the fundamental theory of different spectroscopic techniques. E-1
2. Recognize the fundamentals, instrumentation and application of various chromatographic methods S-17
3. Discuss the instrumentation and application of various spectroscopic techniques S- 19
4. Describe various X-ray methods E-1
5. Apply the knowledge of chromatographic techniques for the separation of the component. ENT-13

Syllabus: **Teaching hours**: **45 Hours**

UNIT I **10 Hours**

- **Spectroscopic Techniques**
  UV-Visible spectrophotometry: Theory of electronic spectroscopy absorption by organic molecules, choice of solvent and solvent effect, applications of UV-Visible spectroscopy.
- **Infra-red spectrophotometry:** Absorption in the infrared region, factors influencing molecular vibrations, applications, interpretation of infra-red spectra, FTIR- Theory, Instrumentation.

UNIT II **10 Hours**

- **Nuclear Magnetic Resonance Spectroscopy:** Basic principles, the theory of PMR spectroscopy, Instrumentation, Chemical shift, spin-spin coupling, factors affecting chemical shift and spin coupling, applications, ^{13}C NMR spectroscopy, interpretation of NMR spectra.
- **Mass spectroscopy:** Basic principles, ion formation and types, Fragmentation rules, recognition of molecular ion peak, interpretation of spectra and applications.

UNIT III **10 Hours**

- **Raman Spectroscopy**: Basic principle, instrumentation, applications
- **Atomic absorption and atomic emission spectroscopy**: Basic principles, instrumentation, applications.
- **X-ray diffraction methods:** Introduction, Bragg's law, X-ray absorption and X-ray diffraction methods and applications.

UNIT IV **15 Hours**

- **Separation techniques** Classification of chromatographic methods based upon the mechanism of separation and mode of separation with its fundamental principle, instrumentation and application
  High-Pressure Liquid Chromatography
  Gas chromatography
  High-Performance Thin Layer Chromatography

Suggested Readings^: (Latest edition)

1. Silverstein, R. M., Bassler, G. C., & Morrill, T. C. Spectrometric Identification of Organic Compounds, John Wiley& Sons. Inc., New York.
2. Kalsi, P. S., Spectroscopy of organic compounds. Place of publication not identified: New Age International Pvt
3. Skoog, D. A. H., James, F., & Nieman, T. A. Principles of Instrumental Analysis. Eastern press.
4. Lindsay, S. High performance liquid chromatography. Chichester: Wiley
5. Ferraro, J. R., Nakamoto, K., & Brown, C. W. Introductory Raman spectroscopy. Amsterdam: Academic Press.
6. The United States Pharmacopeia. By authority of the United States Pharmacopoeial Convention meeting at Washington, D.C., May 14 and 15, 1940. Easton, PA: Mack Print.
7. Sethi, P. D. HPTLC: High performance thin layer chromatography: Quantitative analysis of pharmaceutical formulations. New Delhi: CBS publ.

L= Lecture, T= Tutorial, P= Practical, C= Credit ^ this is not an exhaustive list

NIRMA UNIVERSITY
Institute of Pharmacy

L	T	P	C
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Course Code	UEIP007
Course Title	Drug Discovery and Development

Course Learning Outcomes (CLO):

After successful completion of the course, student will be able to –

1. Understand the overall process for drug discovery and development.
2. Describe various methods of drug discovery.
3. Discuss different techniques of drug design and molecular modeling.
4. Explain the role of combinatorial chemistry in rational drug design.
5. Use bioinformatics, cheminformatics, genomic and proteomics knowledge for drug discovery.

Syllabus: **Teaching hours: 45 Hours**

UNIT I — **10 Hours**

Introduction to Drug Discovery and Development

- Historical development, drug development pipelines, various stages and their importance, improvement of existing drugs, pre-marketing development of drugs, synthetic screening including extensive screening, random screening of intermediates and final leads, source of new drug discovery.

UNIT II — **10 Hours**

Methods in Drug Discovery

- Introduction, structure activity relationships and quantitative structure activity relationships, structure toxicity relationships, various physiological properties, mathematical models, experimental and theoretical approaches of physicochemical parameters, parameter inter-dependence, case studies.

UNIT III — **10 Hours**

Drug Design and Molecular Modeling

- General introduction, pharmacophore model, primary biological targets, structural determination of primary targets, introduction to docking, molecular docking, *in silico* prediction by molecular docking, methodologies with suitable case studies.

UNIT IV — **10 Hours**

Combinatorial Chemistry in Drug Design

- Introduction, principle of combinatorial chemistry, synthetic methodologies including solid phase synthesis (SPS) and solution phase chemistry, high throughput screening, library preparation.

UNIT V — **05 Hours**

Bioinformatics, Cheminformatics, Genomic and Proteomics

- Introduction, application, significances in new drug discovery, suitable case studies in each topic.

Suggested Readings^: (Latest edition)

1. Robert, G.C.K. ed. *Drug Action at the Molecular Level*. University Prak Press Baltimore.
2. Cohen N. C. *A Guidebook on Molecular Modeling and Drug Design*. Elsevier Publications.
3. Wilson, C. O., Beale, J. M., & Block, J. H. Wilson and Gisvold. *A textbook of organic medicinal and pharmaceutical chemistry*. Lippincott Williams & Wilkins.
4. Foye, W. O. *Foye's principles of medicinal chemistry*. Lippincott Williams & Wilkins..
5. Koro l.A. Burckhalter J.H. *Essentials of Medicinal* Chemistry. Wiley Interscience
6. Burger, A., & Abraham, D. J. *Burger's medicinal chemistry and drug discovery* (Vol. I–IV). Wiley.
7. Krogasgaard, P. *A textbook of Drug Design and Development*. Harwood Academics.
8. Smith, H. J., & Williams, H. (2016). *Introduction to the principles of drug design*. Elsevier.
9. Silverman, R. B., & Holladay, M. W. (2014). *The organic chemistry of drug design and drug action*. Academic press.

L= Lecture, T= Tutorial, P= Practical, C= Credit

^ this is not an exhaustive list

UEIP013 HEALTH AND NUTRITION

COURSE NAME: HEALTH AND NUTRITION

Course Code: UEIP013

After successful completion of the course student will be able to:

1. Remember the fundamentals of health and nutrition
2. Cite examples of food labelling
3. Describe significance of macronutrients and micronutrients
4. Discuss importance of functional foods
5. Explain indicators of nutritional status

L P C 3 -- 3

1. Introduction to the basic concepts of health and nutrition

2. Nutrition

- Macronutrients: Carbohydrates (including dietary fibers), fats and proteins
- Micronutrients: Vitamins, minerals, anti-oxidants, gut flora
- Significance of macronutrients and micronutrients for optimal health

3. Meal Planning

- Functional foods: Definition of functional foods, Role of functional ingredients and food in nutrition, Health attributes of functional foods
- Health attributes of nutrition: Diet and disease, Diet with respect to special population (elderly, pediatric and pregnant women),
- Indicators for maintenance of nutritional status: Nutrition Balance Indicator, Satiety Index, Fullness factor, Glycemic index and insulin index

4. Food Labelling (Food service management)

- Nutrition Facts Panel
- Serving Size
- Calories
- Ingredients list
- Quantitative indications
- Food additives
- The percent daily value
- Allergan labelling

Total Lectures - **45**

Books Recommended

1. Nutritional Sciences: From fundamental to food. By Michelle McGuireand Kathy Beerman. Publisher: Yolanda Cassio. ISBN-13: 978-0840058201

2. Pressman, Alan H., Sheila Buff, and Gary Null. The Complete Idiot's Guide to Vitamins and Minerals. New York: Alpha Books.

3. Focus on Pathophysiology, Barbara A. Bullock and Reet L. Henze Lippincott Williams & Wilkins, Philadelphia
4. Lehninger Principles of Biochemistry, 3rd ed London : Macmillan Press Ltd.

5. Tortora G.J. and Anagnodokos, N.P. Principles of Anatomy and Physiology (Harper and Colling Publishers, New York)

6. Advanced Nutrition: Macronutrients, Micronutrients, and Metabolism By: Carolyn D. Berdanier, Lynnette A. Berdanier, Janos Zempleni. Publisher: CRC Press. ISBN 9781420055528
7. Functional Foods and Nutraceuticals By: Aluko, Rotimi E. Publisher: Springer

8. B. Srilakshmi. Food science. India, New Age International (P) Limited.

9. Kumud Khanna, Sharda Gupta, Santosh Jain Passi, Rama Seth, Ranjana Mahna & Seema Puri . Textbook of Nutrition and Dietetics. India, Elite Publishers.
C.Gopalan. Nutritive Value of Indian Foods, India, ICMR publications.