# VIVEKANANDA GLOBAL UNIVERSITY, JAIPUR (Effective from session 2018-19)

**Semester III** **B.Tech in Electronics & Communication Engineering**

## MAT 105 ADVANCE ENGINEERING MATHEMATICS

**3L-1T-0P-3.5C** **M.M. 100**

**Module1:LAPLACE TRANSFORM** - Laplace transform with its simple properties, applications to the solution of ordinary and partial differential equations having constant co-efficient with special reference to the wave and diffusion equations.

**Module 2: FOURIER SERIES & Z TRANSFORM** – Expansion of simple functions in Fourier series. Half range series, Change of intervals, Harmonic analysis. Z -TRANSFORM - Introduction, Properties, Inverse Z Transform.

**Module3: FOURIER TRANSFORM** - Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.

**Module4: COMPLEX VARIABLES I** - Analytic functions, Cauchy-Riemann equations, Elementary Transformations, Line integral in complex domain, Cauchy;s theorem. Cauchy's integral formula.

**Module5: COMPLEX VARIABLES II** -Taylor's series Laurent's series poles, Residues, Evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.

**Text/Reference Books:**


1. Engineering Mathematics, T Veerarajan, TMH
2. Mathematical Techniques, Jordan, Oxford
3. Advance Engineering Mathematics, Potter, Oxford
4. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley
5. Mathematical Methods, Dutta, D., New Age
6. Text BOOK Of Engineering Mathematics, Dutta, New Age

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BEC 301 ELECTRONICS DEVICES AND CIRCUITS

**3 L-0T-0P-3C** **M.M. 100**

**MODULE1: SEMICONDUCTOR PHYSICS** - Mobility and conductivity, Charge densities in a semiconductor, Fermi Dirac distribution, Fermi-Dirac statistics and Boltzmann approximation to the Fermi-Dirac statistics, Carrier concentrations and Fermi levels in semiconductor, Generation and recombination of charges, Diffusion and continuity equation, Transport equations, Mass action Law, Hall effect.

**MODULE 2: JUNCTION DIODES** - Formation of homogenous and hetro-juntion diodes and their energy band diagrams, Calculation of contact potential and depletion width, V-I characteristics, Small signal models of diode, Diode as a circuit element, Diode parameters and load line concept, C-V characteristics and dopant profile. Applications of diodes in rectifier, Clipping, Clamping circuits and voltage multipliers, Breakdown diodes, Schottky diodes, and Zener diode as voltage regulator, Construction, Characteristics and operating principle of UJT.

**MODULE 3: TRANSISTORS** - Characteristics, Current components, Current gains: alpha and beta. Variation of transistor parameter with temperature and current level, Operating point, Hybrid model, DC model of transistor, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC analysis of single stage CE, CC (Emitter follower) and CB amplifiers AC & DC load line, Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability.

**MODULE 4: JFET & MOSFET** - Construction and operation, Noise performances of FET, Parasitic of MOSFET, Small signal models of JFET & MOSFET, Biasing of JFET's & MOSFET's, Low frequency single stage CS and CD (source follower) JFET amplifiers, FET as voltage variable resistor and FET as active load.

**MODULE 5: SMALL SIGNAL AMPLIFIERS AT LOW FREQUENCY** - Analysis of BJT and FET multistage amplifier, DC and RC coupled amplifiers. Frequency response of single and multistage amplifier, mid-band gain, gains at low and high frequency. Analysis of DC and differential amplifiers, Miller's Theorem, use of Miller and bootstrap configuration, Darlington Emitter pair.

**Text/Reference Books:**

1."Integrated Electronics Analog and Digital Circuits & Systems" Millman J. &Halkias C.C., McGraw Hill.
2."Electronic Devices and Integrated Circuits" B. P. Singh and Rekha Singh, , Pearson Education
3."Application of Analog Integrated Circuits" Soclof, SPrentice Hall of India.
4. Electronics Devices & Circuit Theory" Boylestad&Nashelskey, Prentice Hall of India.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BEC 302 ELECTRONIC MATERIALS & PROCESSES

**3L-0T-0P-3C** **M.M.100**

**Module1: DIELECTRIC MATERIALS –** Static dielectric constant, Polarization, atomic interpretation of the dielectric constant of mono-atomic and poly atomic gases, internal fields in the solids and liquids, static dielectric constants of solids, ferroelectric materials and spontaneous polarization, piezo- electricity. Frequency dependence of electronics, ionic and Orientational polarization, complex dielectric constant and dielectric losses.

**Module 2: CONDUCTIVITY OF METALS –** Ohm's Law and relaxation time of electrons, collision time and mean free path. Electron scattering and resistivity of metals. Heat developed in current carrying conductor, thermal conductivity of metals, superconductivity.

**Module 3: MAGNETIC MATERIALS –** Magnetization from microscopic view point, orbital magnetic dipole movement and angular momentum materials, diamagnetism, origin of permanent magnetic dipoles in material. Paramagnetic spin systems.

**Module 4: PROPERTIES OF FERROMAGNETIC MATERIALS –** Spontaneous magnetization and the Curie-Weils Law. Ferromagnetic Domains and coercive force, antiferromagnetic and ferromagnetic materials. Magnetic materials for electrical devices, introduction to permanent magnets.

**Module 5: INTRODUCTION TO IC TECHNOLOGIES** - Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth, Characterization & evaluation of Crystals; Wafer Preparation- Silicon Shaping, Etching and Polishing, Chemical cleaning.
DIFFUSION & ION IMPLANTATION – Fick's diffusion Equation in One Dimension, Atomic model, Analytic Solution of Fick's Law, correction to simple theory, Diffusion in $SiO_2$. Introduction to photo/optical lithography, Contact/ proximity printers.

**Text/Reference Books:**

1. "Electrical Engineering materials" by A.J. Dekker.
2. "Electrical Engineering Materials" by G.P. Chhalotra.
3. "Electrical Engineering materials" by S.P. Seth and P.V. Gupta.
4. "Semiconductor Devices: Modelling And Technology", Nandita Dasgupta, Amitava Dasgupta, PHI
5. "Fundamentals Of Semiconductor Fabrication", Gary S. May, S.M.Sze, John Wiley & Sons
6. "Semiconductor Devices: Physics And Technology", Simon M. Sze, John Wiley & Sons

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BEC 303 : DIGITAL ELECTRONICS

**3L-0T-0P-3C** **MM 100**

**MODULE 1: NUMBER SYSTEMS AND CODES:** Introduction to number systems, weighted and non-weighted codes, 1's complement, 2's complement, complement arithmetic
**Introduction to Boolean Algebra:** Postulates and theorems of Boolean algebra, Boolean functions, canonical and standard form, simplification of Boolean function using Boolean laws and theorems

**MODULE 2: LOGIC GATES:** Diode and transistor as a switch, basic logic gates, derived logic gates, block diagrams and truth tables, logic diagrams from Boolean expression and vice versa, converting logic diagram to universal logic, positive logic, negative logic and mixed logic

**MODULE 3: SIMPLIFICATION OF BOOLEAN FUNCTIONS:** K-map representation, incompletely specified functions, simplification realization with gates, Quine-McCluskey method. **Combinational Logic:** Analysis and design of combinational circuits, half adder and full adder, half subtract or and full subtract or, binary serial and parallel adder, BCD adder, binary multipliers, magnitude comparator, decoders, encoders, multiplexers, de-multiplexers

**MODULE4: SEQUENTIAL CIRCUITS:** Latches, flip-flops, triggering of the flip-flops, master-slave flip-flop, excitation tables, conversion of the flip-flops, analysis and design of clocked sequential circuits, shift registers, counters

**MODULE5: LOGIC FAMILIES:** Logic gate characteristics (propagation delay, speed, noise margin, fan-in, fan-out, power dissipation), standard logic families (RTL, DCTL, DTL, TTL, ECL, MOS),tri-state devices
**Programmable Logic:** Introduction to programmable logic array (PLA) & programmable array logic (PAL

**Text/Reference Books:**

1. "Digital Design", Moris Mano, Pearson Education
2. "Digital Fundamental", Floyd and Jain, Pearson Education
3. "Digital System: Principles and Applications", Tocci, Pearson Education
4. "Digital Electronics", B. P. Singh, Dhanpat Rai & Sons
5. "Modern Digital Electronics", R. P. Jain, Tata McGraw-Hill

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BEC 304 ANALOG ELECTRONICS

**3L-0T-0P-3C** **M.M.100**

**MODULE 1: FEEDBACK AMPLIFIERS** - Classification, Feedback concept, Feedback Topologies, Transfer gain with feedback, General characteristics of negative feedback amplifiers. Analysis of voltage-series, voltage-shunt, current-series and current-shunt feedback amplifier. Stability criterion. Compensation techniques, miller compensation.

**MODULE 2: OSCILLATORS & MULTIVIBRATORS** - Classification. Criterion for oscillation. Tuned collector, Hartley, Colpitts, RC Phase shift, Wien bridge and crystal oscillators, Astable, monostable and bistable multivibrators. Schmitt trigger. Blocking oscillators.

**MODULE 3: HIGH FREQUENCY AMPLIFIERS** - Hybrid Pi model, Conductances and capacitances of hybrid Pi model, high frequency analysis of CE amplifier, gain bandwidth product, unity gain frequency fT, Emitter follower at high frequencies.

**MODULE 4: TUNED AMPLIFIER** - Band Pass Amplifier, Parallel resonant Circuits, Band Width of Parallel resonant circuit. Analysis of Single Tuned Amplifier, Primary & Secondary Tuned Amplifier with BJT & FET, Double Tuned Transformer Coupled Amplifier. Stagger Tuned Amplifier. Pulse Response of such Amplifier, class C tuned amplifiers, Shunt Peaked Circuits for Increased Bandwidth.

**MODULE 5: POWER AMPLIFIERS** - Classification, Power transistors & power MOSFET (DMOS, VMOS). Output power, power dissipation and efficiency analysis of Class A, class B, class AB, class C, class D and class E amplifiers as output stages. Pushpull amplifiers with and without transformers, Complementary symmetry & quasi complimentary symmetry amplifiers.

**Text/Reference Books:**

1. "Electronic devices and circuits"J. Millman and Halkias, TMH
2. "Electronic devices and circuits" Salivahanan, Suresh Kumar, Vallavaraj, TMH
3. "Integrated Electronics, Analog & Digital Circuits & Systems"J. Millman and Halkias, TMH
4. "Electronic Devices & Circuit Theory" Boylestad&Nashelsky, PHI
5. "Micro Electronic Circuits" Sedra& Smith, Oxford University Press
6. "Electronic Devices & Circuits" J.B.Gupta, S. K. Kataria.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BEC 305 OPTOELECTRONICS

**3L-0T-0P-3C** **M.M.100**

**MODULE 1: WAVE GUIDE AND OPTICAL FIBERS:** Total internal reflection, Dielectric Slab waveguides, Optical fiber waveguides, Step & graded index optical fibers, modes of propagation. Losses in fibers, Fiber jointing, Fiber materials & manufacture & fiber cables

**MODULE 2: PHOTO SOURCES:** p-n junction, Injection Luminescence & the light emitting diode, materials, construction & drive Circuitry, LED power &efficiency, LED characteristics & modulation bandwidth.

Lasers: Emission & absorption of radiation, Einstein relations, Population inversion, Optical feed back, Threshold conditions, Laser modes. Semiconductor Lasers

**MODULE 3: PHOTO DETECTORS:** Optical detection principles, Absorption, Quantum efficiency, Responsivity, Long wavelength cut-off, P-N photodiode, Speed of response, Noise, Avalanche photodiode, Multiplication factor

**MODULE 4: ELECTRO- OPTIC EFFECTS:** Integrated optical devices, Optical bistability& Digital optics, Optical computation, Magneto-optic Effect, Acousto-optic Effect, Nonlinear optics, Holography

**MODULE 5: SENSORS & DISPLAY DEVICES:** Optical Fiber sensors, Display Devices, Plasma display, LCD Display, Numeric Display

**Text/Reference Books:**

1. "Opto-Electronics An Introduction"Wilson, J. &Haweks, J.F.B. Prentice Hall (India)
2. "Optical Fiber communication"Senior, John M., Prentice Hall (India)
3. "Semiconductor Optoelectronics Devices" Bhattacharya, Pallab, Pearson Education.
4. "Optoelectronics An Introduction to Materials and Devices" Singh, Jasprit, McGraw-Hill
5. "Fiber Optics & Optoelectronics" Khare, R.P, Oxford University Press
6. "Text Book of Optical Fiber Communication & Its Applications" Gupta, S.C., Prentice–Hall (India).

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BCS 302 OBJECT ORIENTED PROGRAMMING WITH C++

**3L-1T-0P-3.5C** **M.M.100**

**MODULE 1: DIFFERENT PARADIGMS FOR PROBLEM SOLVING**: need for OOP, differences between OOP and Procedure oriented programming, Abstraction, Overview of OOP principles, Encapsulation, Inheritance and Polymorphism.

**MODULE 2**: **C++ BASICS**: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, go to statements. Functions-Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions.

**MODULE 3: MEMORIES:** Dynamic memory allocation and de-allocation operators-new and delete, Preprocessor directives. C++ Classes And Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

**MODULE 4**: **POLYMORPHISM**: Function overloading, Operator overloading, Generic programming necessity of templates, Function templates and class templates. Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

**MODULE 5**: **VIRTUAL FUNCTIONS AND POLYMORPHISM** - Static and Dynamic bindings, Base and Derived class virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

**Text/Reference Books:**

1. Problem solving with C++, The OOP, 4th Edition, Walter Savitch, Pearson Education.
2. C++, The Complete Reference, 4th Edition, Herbert Schildt, TMH.
3. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
4. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education.
5. Object Oriented Programming in C++, 3rd Edition, R.Lafore, Galigotia Publications pvt ltd.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BCS 402 SOFTWARE ENGINEERING

**3L-0T-0P-3C** **M.M.100**

**Module1: INTRODUCTION**-Notion of Software as a Product–characteristics of a good Software Product. Engineering aspects of Software production–necessity of automation. Job responsibilities of Programmers and Software Engineers as Software developers.

**MODULE2: PROCESS MODELS AND PROGRAM DESIGN TECHNIQUES**- Software Development Process Models–Code & Fix model, Water fall model, Incremental model, Rapid Prototyping model, Spiral (Evolutionary) model. Good Program Design Techniques–Structured Programming, Coupling and Cohesion, Abstraction and Information Hiding, Automated Programming, Defensive Programming, Redundant Programming, Aesthetics. Software Modeling Tools– Data flow Diagrams, UML and XML. Jackson System Development.

**MODULE3: VERIFICATION AND VALIDATION**- Testing of Software Products–Black-Box Testing and White-Box Testing, Static Analysis, Symbolic Execution and Control Flow Graphs–Cyclomatic Complexity. Introduction to testing of Real-time Software Systems.

**MODULE4: SOFTWARE PROJECT MANAGEMENT**- Management Functions and Processes, Project Planning and Control, Organization and Intra-team Communication, Risk Management. Software Cost Estimation–underlying factors of critical concern. Metrics for estimating costs of software products–Function Points. Techniques for software cost estimation– Expert judgment, Delphi cost estimation, Work break-down structure and Process break- down structure, COCOMO and COCOMO-II.

**MODULE5: ADVANCED TOPICS**: Formal Method sin Software Engineering–Z notation, Hoare "notation. Formalization of Functional Specifications–SPEC. Support environment for Development of Software Products. Representative Tools for Editors, Linkers, Interpreters, Code Generators, Debuggers. Tools for Decision Support and Synthesis, Configuration control and Engineering Databases, Project Management. Petrinets. Introduction to Design Patterns, Aspect-oriented Programming.

**Text / ReferenceBooks:**

1. "Software Engineering: A Practitioner's Approach" R.S. Pressman, , McGraw-Hill
2. "An Integrated Approach to Software Engineering" P. Jalote, Narosa Publishing House
3. "Fundamentals of Software Engineering" R. Mall, Prentice-Hall of India.
4. "Software engineering" I. Sommerville, (9th edition), Addison WesleY.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BCS 301 DATA STRUCTURE AND ALGORITHM

**3L-0T-0P-3C** **MM 100**

**MODULE1:INTRODUCTION TO DATA STRUCTURES -** Definition of data structures and abstract data types. Static and Dynamic implementations. Examples and real life applications, Data Structures: Arrays, Address calculation in a single and multi-dimensional array. Sparse matrices

**MODULE 2: STACKS, QUEUES AND LISTS -** Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples: Infix, postfix, prefix representation, Applications: Mathematical expression Evaluation Definition: Queues & Lists: Array based implementation of Queues / Lists, Linked List implementation of Queues / Lists, Circular implementation of Queues and singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority queues, Applications

**MODULE 3: TREES & GRAPHS -** Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal - preorder, post order, in order traversal, Binary Search Trees, Implementations, Threaded trees, Balanced multi way search trees, AVL Trees, Implementations, Applications Definition of Undirected and Directed Graphs and Networks, The Array based implementation ofgraphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal – Breadth first Traversal, Depth first Traversal,Connectivity of graphs; Connected components of graphs, Weighted Graphs, Applications.

**MODULE 4: SORTING SEARCHING ALGORITHMS -** Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Pseudo code algorithm and their C++ implementation, Efficiency of above algorithms, Shellsort, Performance of shell sort, Merge sort, Merging of sorted arrays, The merge sort Algorithms, Quick sort Algorithm.

**MODULE 5: ANALYSIS OF QUICK SORT, PICKING A PIVOT -** A partitioning strategy, Heap sort, Heap Construction, Heap sort, bottom – up, Top – down Heap sort approach, Radix sort, Straight Sequential Search, Array implementations, Linked List representations, Binary Search, non – recursive Algorithms, recursive Algorithms, Indexed Sequential Search

**Text/Reference Books:**

1. “Theory & Problems of Data Structures” by Jr. SymourLipschetz, Schaum’s outline by TMH
2. “Data Structures using C” by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.
3. “Data Structures and Algorithms” by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
4. “Fundamentals of Data structures” by Ellis Horowitz &SartajSahni, Pub, 1983,AW

## MAT 106 RANDOM VARIABLES & STOCHASTIC PROCESSES

**3L-0T-0P-3C** **M.M.100**

**MODULE1: PROBABILITY –** Sets and set operations; Probability space; Conditional probability and Bayestheorem; Combinatorial probability and sampling models.

**MODULE 2: RANDOM VARIABLES -** Introduction, distribution & density functions, discrete & continuous random variables, special distributions: binominal, Poisson, uniform, exponential, normal, Rayleigh. Conditional distribution & density functions.

**MODULE 3: MULTIPLE RANDOM VARIABLES -** Vector random variable, joint distribution functions, and joint probability density function, conditional distribution & density functions. Statistical independence, distribution & density function of sum of random variable, one function of one random variable, one function of two random variable, two function of two random variable.

**MODULE 4: OPERATION ON SINGLE & MULTIPLE RANDOM VARIABLES -** Mean &variance, moments, Chebyshev's inequality, Central limit theorem, characteristic functions & moment generating function, covariance & correlation coefficient of multiple random variables.

**MODULE 5: STOCHASTIC PROCESSES -** Introduction, random process concept, stationary & independence, ergodicity, correlation, functions. Gaussian Random Process, Transmission of Random process through linear systems. Power spectral Density, Cross Spectral density.

**Text/Reference Books:**

1. "Classical Electrodynamics", Jackson, Wiley
2. "Probability, Statistics And Random Processes", Veerarajan,
3. "Probability, Random Variables And Stochastic Processes", Papoulis, TMH
4. "Probability, Random Variables And Random Signal Principles", Peebles, TMH
5. "Probability And Random Processes With Application To Signal Processing", Stark, TMH
6. "Probability And Random Processes For Electrical Engineering", Leongarcia, Pearson
7. "Probability & Measure, Billingsley, Pearson
8. "An Introduction To Probability Theory & Its App.", Feller, Wiley
9. "Probability & Statistics In Engg.", Hines, Wiley

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BEC 306 ELECTRONIC DEVICES AND CIRCUITS LAB

**0L-0T-2P-1C** **M.M.100**

1. Study the following devices: (a) Analog & digital multimeters (b) Function/ Signal generators (c) Regulated d. c. power supplies (constant voltage and constant current operations) (d) Study of analog CRO, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.

2. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.

3. Plot V-I characteristic of zener diode and study of zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.

4. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.

5. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss & Vp.

6. Application of Diode as clipper & clamper.

7. Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.

8. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.

9. Plot input and output characteristics of BJT in CB, CC and CE configurations. Find their h-parameters.

10. Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.

11. Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.

## BEC 307 DIGITAL ELECTRONICS LAB

**0L-0T-2P-1C** **M.M.100**

**All the experiments using Bread Board:**

1. To study and perform the following experiments.
   (a) Operation of digital multiplexer and demultiplexer.
   (b) Binary to decimal encoder.
   (c) Characteristics of CMOS integrated circuits.
2. To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks.
3. To study and perform experiment -Digital to analog and analog to digital converters.
4. To study and perform experiment- Various types of counters and shift registers.
5. To study and perform experiment - Interfacing of CMOS to TTL and TTL to CMOS ICs.
6. To study and perform experiment- BCD to binary conversion on digital IC trainer.
7. To study and perform experiment -
   Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different parameters, observe voltage waveforms at different points of transistor.
8. To study and perform experiment -Voltage comparator circuit using IC-710.
9. To study and perform experiment- Schmitt transistor binary circuit.
10. Design 2 bit binary up/down binary counter on bread board.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BEC 308 ANALOG ELECTRONICS LAB

**0L-0T-2P-1C** **M.M.100**

1. Plot gain-frequency characteristics of BJT amplifier with and without feedback in the emitter circuit and determine bandwidths, gain bandwidth products and gains at 1kHz with and without negative feedback.

2. Study of series and shunt voltage regulators and measurement of line regulation and ripple factor.

3. Plot and study the characteristics of small signal amplifier using FET.

4. Study of push pull amplifier. Measure variation of output power & distortion with load.

5. Study Wein bridge oscillator and observe the effect of variation in R oscillator frequency.

6. Study transistor phase shift oscillator and observe the effect of variation in R & C on oscillator frequency and compare with theoretical value.

7. Study the following oscillators and observe the effect of variation of C on oscillator frequency: (a) Hartley (b) Colpitts

8. Study of a Digital Storage CRO and store a transient on it.

9. To plot the characteristics of UJT and UJT as relaxation.

10. 11 To plot the characteristics of MOSFET.

**Semester III** **B.Tech in Electronics & Communication Engineering**

**BCS 305 OBJECT ORIENTED PROGRAMMING LAB WITH C++ Lab**

**0L-0T-2P-1C** **M.M.100**

1. Create a user defined function (any) and use it inside the program.
2. Implement "call by value" & "call by reference " function call techniques by using any user defined functions.
3. Implement the working of classes and objects by using any real world object.
4. Create a Stack object model in C++ & also make use of default and parameterized constructor to make the class more flexible in use.
5. Make all the member functions, including constructors, non-inline in the above class.
6. Create any user defined class using the concept of static data and member functions.
7. Create a Class or program implementing the concept of passing and returning object to/from member functions.
8. WAP to implement polymorphism through function overloading (Area of different shapes).
9. Create a user defined type Complex and do all the Complex number arithmetic. And also make use of operator overloading.
10. Implement single level inheritance by using Student and Marks class.
11. Implement multilevel inheritance by using the Stack class.
12. Demonstrate the calling mechanism of constructors and destructors in Multilevel Inheritance.
13. Create generic Stack model for storing different types of data.
14. Create a user defined type Matrix and perform all matrix operations. Also make use of operator overloading.
15. Implement the concept of abstract classes and virtual functions by using Shape, Rectangle and Triangle class.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BCS 304 DATA STRUCTURE LAB

**0L-0T-2P-1C** **M.M.100**

1. Program on array searching, sorting (Bubble sort, Quick sort, Marge sort etc.)

2. Program to insert element at desire position, replacing element, deletion in array.

3. Various matrices operations.

4. Various strings programs.

5. Implementation of stack and queue using array

6. Implementation of stack and queue using link lists

7. Implementation of circular queue using link lists.

8. Polynomial addition, multiplication.

9. Two-way link lists programs.

10. Infix to postfix/prefix conversion.

11. BST implementation (addition, deletion, searching).

12. Stack ADT (array implementation) Implementing basic operation of stack (push, pop) using array implementation

**Semester III** **B.Tech in Electronics & Communication Engineering**

## BCS405 SOFTWARE SYSTEM DESIGN LAB

**0L-0T-2P-1C** **M.M.100**

In this lab first 8 experiments are to practice software engineering techniques. Use any open source CASE tool. Many of them are available at www.sourceforge.net. You can choose any other CASE tool, as per choice.

Language: C++ / JAVA Design Approach : Object Oriented

These designing can be done on any automation system e.g. library management system, billing system, payroll system, bus reservation system, gas agency management system, book-shop management system, students management system.

1. Do feasibility study?
2. Document all the requirements as specified by customer in Software Requirement Specification
3. Design sequence diagrams for project
4. Design Collaboration diagram
5. Design Data Flow Diagram for the project
6. Design Entity Relation Diagram for the project
7. Design Class diagram
8. Design at least 10 test cases for each module.
9. -10: Code and test the project, which you have designed in last 8 labs.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## MGT 201 ORIENTATION PROGRAM IN ENTREPRENEURSHIP

**0L-0T-2P-1C** **M.M. 100**

**OBJECTIVE**: The goal of this program is to inspire students and help them imbibe an entrepreneurial mindset. Student will learn what entrepreneurship is and how it has impacted the world and their country. They will introduce to the key traits and the DNA of an entrepreneur. This certificate program focuses on a specific Entrepreneurial knowledge or skill requirement such as creative thinking, communication, risk taking and resilience.

**Module 1**:
Entrepreneurship; Concept, functions, Need, Characteristics and competency. How has entrepreneurship change the world? Process of Entrepreneurship development , Idea Generation exercises.

**Module 2**:
Entrepreneurial DNA, Traits Gaps and Gap Analysis. Relevance of Entrepreneurship in Socio-Economic development. Barriers to Entrepreneurship. Case studies.

**Module 3**:
Entrepreneurial Pursuits and Human Activities; nature, purpose and pattern of Human activities: Economic and non-economic, need for innovation. Creativity. Case studies

**Module 4**:
Entrepreneurial Values, Attitudes and Motivation-Meaning and concept. Developing entrepreneurial Motivation -concept and process of achievement motivation. Leadership, Communication and influencing ability. Success stories.

**Module 5**:
**Enterprise and Environment:** Environmental function, Critical factors for launching of a new enterprise, Understanding a market, Competitive analysis of the market.

**Suggested Readings:**
Online course through massive open online classes (MOOC), classroom learning through an experienced facilitator/faculty on campus (games, video, and practical experience

1.Vasanta Desai: Dynamics of entrepreneurial development and management;
2. Vasanta Desai: Entrepreneurial development;
3. Peter F. Drucker: Innovation and development;
4. M.V. Deshpande: Entrepreneurship of small scale industries;
5. Balakrishnan, G. Financing of small scale industries.

**Semester III** **B.Tech in Electronics & Communication Engineering**

## ENG 115 SOFT SKILL & PROFESSIONAL APTITUDE

**0L+0T+2P +1C** **MM 100**

**MODULE: 1- INTERPERSONAL RELATIONSHIP MANAGEMENT-** Importance & Benefits of IPR, Developing Interpersonal Abilities, Team Building- Definition and Types, Team work skills, Qualities of a Team Player, Leadership- Understanding the qualities of a Good Leader, 4 Factors of Leadership, Bring out the Leader in You

**MODULE: 2- RESUME WRITING-** Concepts of Resume, Curriculum Vitae and Bio-data, Resume – Information and Details, Sample Resume and Template, Cover Letter- Cover letter Writing, Sample Cover letter and Template

**MODULE: 3 -PERSONAL GROOMING AND INTERVIEW ETIQUETTE-** Basic Personal Hygiene, Professional Attire – Men& Women, Interview Etiquette Guide, Telephonic Interview- Importance and Preparation, Advantages and Disadvantages, Things to Remember, Video Interview- Preparation and Practice, Guide to a Successful Video Interview, Importance and Types of Personal Interviews, FAQs with Answers

**MODULE: 4 - GROUP DISCUSSION-** Group Discussion Guide, Topics for Group Discussion, Mock GD

**MODULE: 5 –EXTEMPORE-** Guide to Successful Extempore, Extempore Topics, Practice Session

**Text/Reference Books:**

1. Business communication Design, Angell, Pamela, Mcgraw-Hill, New York.
2. Grammar Finder, Eastwood, John, Oxford university press.
3. Effective technical communication, Mitra, K. Barun, Oxford university press.
4. Communicate to conquer: A handbook of group discussion and interviews, PHI learning, New Delhi.

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEE 401 CIRCUIT ANALYSIS AND SYNTHESIS

**3L-1T-0P-3.5C** **M.M.100**

**MODULE 1: GRAPH THEORY -** Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

**MODULE 2: NETWORK FUNCTIONS:** The concept of complex frequency, series and parallel combinations. Terminals and terminal pairs, driving point impedance transfer functions, poles and zeros. Restrictions on pole and zero location in s-plane. Time domain behaviour from pole and zero plot. Procedure for finding network functions for general two terminal pair networks

**MODULE 3: NETWORK SYNTHESIS:** Hurwitz polynomial, positive real functions, reactive networks. Separation property for reactive networks. The four-reactance function forms, specification for reactance function. Foster form of reactance networks. Cauer form of reactance networks. Synthesis of RL and R-C networks in Foster and Cauer forms.

**MODULE 4: TWO PORT GENERAL NETWORKS:** Two port parameters (impedance, admittance, hybrid, ABCD parameters) and their inter relations. Equivalence of two ports. Transformer equivalent, inter connection of two port networks. The ladder network, image impedance, image transfer function, application to L-C network, attenuation and phase shift in symmetrical T and pi networks.

**MODULE 5: TWO PORT REACTIVE NETWORK (FILTERS):** Constant K filters. The m-derived filter. Image impedance of m-derived half (or L) sections, composite filters. Bands pass and band elimination filters. The problem of termination, lattice filters, Barlett's bisection theorem. Introduction to active filters.

**Text/Reference Books:**

1. "An Introduction to Modern Network Synthesis"M. E. Van Valkenburg, , Wiley Eastern
2. "Circuits & Networks" Nagsarkar&Sukhija, , Oxford
3. "Network & Systems" ChoudharyD.Roy, , Wiley Eastern Ltd.
4. "Network Analysis and Synthesis" Ghosh&Chakrabarti, , TMH
5. "Network Theory: Analysis and Synthesis" SamarajitGhosh, , Prentice Hall of India, 2008
6. "Circuit Theory" A.Chakrabarti, , DhanpatRai& Co.

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEE 402: ELECTRICAL AND ELECTRONICS MEASUREMENT AND INSTRUMENTATION

**3L-0T-0P -3C** **MM 100**

**MODULE 1: INTRODUCTION -** Functional elements of an instrument – Static and dynamic characteristics, Accuracy & precision, Repeatability, Limits of errors, Systematic & random errors Modeling of errors, Probable error & standard deviation, Gaussian error analysis, Combination of errors – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

**MODULE 2: ELECTRICAL AND ELECTRONIC INSTRUMENTS -** Principle and types of analog and digital voltmeters, ammeters, multi-meters – Single and three phase watt-meters and energy meters – Magnetic Measurement - Ballistic Galvanometer, **f**lux meter, determination of hysteresis loop, measurement of iron losses. Instrument transformers– Instruments for measurement of frequency and phase.

**MODULE 3: MEASUREMENT OF PARAMETERS-**D.C & A.C potentiometers, Electronic Voltmeter, Electronic Multimeters, Digital Voltmeter, Vector Impedance meter, RF Power & Voltage Measurements. Different methods of measuring low, medium and high resistances**,** measurement of inductance, frequency & capacitance with the help of AC Bridges, Q Meter.

**MODULE 4: DISPLAY DEVICES AND SIGNAL GENERATION -** CRT display, digital CRO, LED, LCD & dot matrix display. Sine wave generators, Frequency synthesized signal generators, Sweep frequency generators. Signal Analysis – Measurement Technique, Wave Analyzers, and Frequency - selective wave analyzer, heterodyne wave analyzer, Harmonic distortion analyzer, and Spectrum analyzer.

**MODULE 5: TRANSDUCERS -** CONSTRUCTION, Working Principles, Application of following Transducers RTD, Thermocouples, Thermistors, LVDT, RVDT, Strain Gauges, Bourdon Tubes, Bellows, Seismic Accelerometers, Tacho generators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meters.

**Text/Reference Books:**

1. "Electrical Measurement &Measuring Instrument", E.W. Golding & F.C. Widdis A.H. Wheeler& Co. India.
2. "Electrical & Electronic Measurement & Instrument", A.K. Sawhney, Dhanpat Rai & Sons
3. "Electrical Measurement", Forest K. Harries, Willey Eastern Pvt. Ltd. India .
4. "Basic Electrical Measurement", M.B. Stout, Prentice hall of India.
5. "Electronic Instrument & Measurement Technique", W.D.Cooper Prentice Hall International.

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 401 ELECTROMAGNETIC FIELD THEORY

**3L-1T-0P-3.5C** **M.M.100**

**MODULE 1: INTRODUCTION:-**Sources and effects of electromagnetic fields – Vector fields – Different coordinate systems - Divergence theorem – Stoke's theorem.

**MODULE 2: ELECTROSTATICS -**Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Gauss's law and application – Electrical potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectric – Dielectric polarization, Electric field in multiple dielectrics – boundary conditions, Poisson's and Laplace's equations – Capacitance-energy density – Dielectric strength.

**MODULE 3: MAGNETOSTATICS -**Lorentz Law of force, magnetic field intensity – Biot–savart Law - Ampere's Law– Magnetic field due to straight conductors, circular loop, infinite sheet of current– Magnetic flux density (B) – B in free space, conductor, magnetic materials –Magnetization – Magnetic field in multiple media – Boundary conditions – Scalar and vector potential – Magnetic force – Torque – Inductance – Energy density –Magnetic circuits.

**MODULE 4: ELECTRODYNAMIC FIELDS -**Faraday's laws, induced emf – Transformer and motional EMF, Maxwell's equations (differential and integral forms) – Displacement current – Relation between field theory and circuit theory.

**MODULE 5: ELECTROMAGNETIC WAVES -**Generation – Electro Magnetic Wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors-skin depth, Pointing vector – Plane wave reflection and refraction.

**Text/Reference Books:**

1. "Electromagnetics"John.D.Kraus, , McGraw Hill book Co., New York, FourthEdition, 1991.
2. "Engineering Electromagnetic"William .H.Hayt, , Tata McGraw Hill edition,2001.
3. "Theory and Problems of Electromagnetic"'Joseph. A.Edminister, ,Secondedition, Schaum Series, Tata McGraw Hill, 1993.
4. "Electromagnetics with Applications" Kraus and Fleish, , McGraw HillInternational Editions, Fifth Edition, 1999.
5. "Elements of Electromagnetics"Sadiku, , Second edition, Oxford University Press, 199

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 402 MICROPROCESSOR AND INTERFACING

**3L-0T-0P-3C** **M.M.100**

**MODULE1:INTRODUCTION TO MICROPROCESSOR-**Overview of microprocessor structure and its operation, Microprocessor evaluation and its types, Address bus , Data bus, Control bus, Demultiplexing and buffering of system bus, peripheral devices and memory organization.

**MODULE 2: 8085 MICROPROCESSOR -** 8085 MPU, Pins and Signals, Microprocessor Architecture, internal data operations and Registers, Memory mapped I/O and Peripheral mapped I/O, 8085 Microprocessor Programming model, Interrupts of 8085, Addressing modes of 8085.

**MODULE 3: ASSEMBLY LANGUAGE PROGRAMMING USING 8085 -** Instruction set, Classification of instructions, Programming technique, Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation, Machine cycle, T-state, Timing Diagram.

**MODULE 4: MICROPROCESSOR SYSTEM PERIPHERAL AND INTERFACE -** Introduction to interfacing, 8155, 8255, 8253, 8257, 8259, 8279, DMA Controller, A/D Conversion, Memory and Keyboard interface.

**MODULE 5: -MICROPROCESSOR – 8086 -** Pins and Signals, Internal architecture , 8086 system configuration and timing, minimum and maximum mode, memory segmentation, Addressing modes of 8086, Instructions set of 8086, Interrupts of 8086.

**Text/Reference Books:**

1. "Microprocessor Architecture, Programming and application with the 8085 by Ramesh Gaonkar, Wiley.
2. "Introduction to Microprocessor" by B. Ram.
3. "Microprocessor Interfacing, programming and hardware" by D. V. Hall, TMH.
4. "Fundamental of Microprocessor", Udaykumar, Pearson.
5. "Microprocessor 8085 and its Interfacing", Sunil kumar, PHI

## BEC 403 ANALOG INTEGRATED CIRCUITS

**3L-0T-0P-3C** **M.M.100**

**MODULE 1: SINGLE STAGE INTEGRATED CIRCUIT AMPLIFIERS:** Comparison of the MOSFET, BJT & Bi-CMOS Circuits, IC Biasing & Modified Current Sources, Amplifiers With Active Load, Cascade Amplifier.

**MODULE 2 : DIFFERENTIAL AMPLIFIERS:** MOS Differential Pair, Non Ideal Characteristics of the Differential Amplifier, Differential Amplifier with Active Load, Freq. Response of Differential Amplifier, Two Stage CMOS Op-Amp, Introduction to OTA.

**MODULE 3 : DATA CONVERTERS:** Different types of Converters- measurement Converters, Voltage Converter, Unit, Power Converter-DAC/ADC.

**MODULE 4 : FILTERS:** Active Filters: Transmission, Types & Specifications, Transfer Function, Butterworth & Chebyshev Filters, First Order & Second Order Filter Functions, Second Order Filter Realization Based on Two Integrator Loop Topology, Noise in Devices, Switched capacitor filters

**MODULE 5 : SIGNAL GENERATORS & WAVE SHAPING CIRCUITS:** Bi-Stable Circuits**:** Comparator, Schmitt Trigger, Generation of Square & Triangular Waveforms, IC Timer 555 and its Applications, PLL And Its Applications, Precision Rectifier Circuits, Voltage Regulators ICs, SMPS

**Text/Reference Books:**

1. "Microelectronic Circuits"Sedra, Adel S., Smith, Kenneth C., Oxford University Press
2. "Microelectronics"Millman, J. &Grabel, A., McGraw-Hill.
3. "Analysis and Design of Analog Integrated Circuits"Gray, P.R., Hurst, P.J., Lewis, S.H. & Meyer, R.G., John Wiley &Sons .
4. "Op-Amps and Linear Integrated Circuits" Gayakwad, R.A., Prentice-Hall (India).
5. "Design of Analog Integrated Circuits and Systems" Laker, Kenneth, Tata McGraw-Hill.
6. "Design with Operational Amplifiers and Analog Integrated Circuits"Franco, Sergio, Tata McGraw-Hill
7. "Application of Analog Integrator Circuits"Soclof, S/Prentice Hall (India).

**Semester IV** **B. Tech in Electronics & Communication Engineering**

## BEC 404 DIGITAL LOGIC DESIGN

**3L-0T-0P-3C** **M.M.100**

**MODULE 1: DESIGN OF COMBINATIONAL LOGIC CIRCUITS:** Gate level design of Small Scale Integration (SSI) circuits, Modular combinational logic elements - Decoders, Encoders, Priority encoders, Multiplexers and Demultiplexers.

Design of Integer Arithmetic Circuits using Combinational Logic: Integer adders - Ripple carry adder and Carry look ahead adder, Integer subtractors using adders, Unsigned integer multipliers - Combinational array circuits, Signed integer multipliers - Booth's coding, Bit-pair recoding, Carry save addition and Wallace tree multiplier, Signed integer division circuits - Combinational array circuits, Complexity and propagation delay analysis of circuits.

**MODULE 2: DESIGN OF COMBINATIONAL CIRCUITS USING PROGRAMMABLE LOGIC DEVICES (PLDS):** Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices, Design of multiple output circuits using PLDs.

**MODULE 3: ANALYSIS AND DESIGN OF SYNCHRONOUS SEQUENTIAL CIRCUITS:** Models of sequential circuits - Moore machine and Mealy machine, Design of sequential circuits - State transition diagram, State table, Next state maps, Output maps, Expressions for flip-flop inputs and Expressions for circuit outputs, Modular sequential logic circuits- Shift registers, Registers, Counters and Random access memories, Design using programmable logic sequencers (PLSs).

**MODULE 4: DESIGN OF ARITHMETIC CIRCUITS USING SEQUENTIAL LOGIC :** Serial adder for integers, Unsigned integer multiplier, Unsigned integer division circuits, Signed integer division, Floating-pint adder/subtractor - Design of control circuit, Floating - point multiplier.

**MODULE 5 : SEQUENCE DETECTION AND STATE REDUCTION METHODS:** Moore and Mealy state graphs for sequence detection, Methods for reduction of state tables, Methods for state assignment.
SVLSI Realization of Digital Systems: Field-Programmable Logic Arrays (FPLAs) and Logic Cell Arrays (LCAs),

**Text/Reference Books:**

1. “Fundamental s of Logic design” C. H. Roth, ,Jaico Publishers
2. “Digital Logic Circuit Analysis and Design”V. P. Nelson J.D. Irwin, , Prentice Hall International
3. “Fundamentals of Logic Design with VHDL Design”S. Brown and Z Vranesic, , Tata McGraw-Hill
4. “Computer Aided Logical Design with Emphasis on VLSI“ G.R.Peterson, John Wiley & Sons

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 405 ANALOG COMMUNICATIONS

**3L-0T-0P-3C** **M.M.100**

**MODULE 1: INTRODUCTION-** Elements of Communication System and its Limitations, Mismatch between Signal & Channel- Modification of Channel or Modification of Signal, Modulation Benefits and Application, An Overview of Different types of Modulations- Analog & Digital, In Analog- Amplitude & Angle (Frequency & Phase) Modulation **Amplitude (Linear) Modulation**: Generation and Detection of AM, DSB, SSB and VSB, Carrier Acquisition, AM Transmitter and Receiver, Time domain and frequency domain description

**MODULE 2: ANGLE MODULATIO -** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

**MODULE 3: NOISE -** Noise in Analog communication System-Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth, effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits. Calculation of signal-to-noise ratio in SSB-SC, DSB-SC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

**MODULE 4: TRANSMITTERS -** Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feed back on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. RECEIVERS : Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

**MODULE 5: PULSE MODULATION -** Time Divison Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM

**Text/Reference Books:**

1. Principles of Communication Systems - Simon Haykin, John Wiley
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems Second Edition – R.P. Singh, SP Sapre, TMH, 2007.
4. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 406 SIGNALS AND SYSTEMS

**3L-0T-0P-3C** **M.M.100**

**MODULE 1: SIGNALS -** Definition, types of signals and their representations: continuous - time/ discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).

**MODULE 2: SYSTEMS -** Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,

**MODULE 3: FOURIER TRANSFORMS (FT) -** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT.

**MODULE 4: LAPLACE-TRANSFORM (LT) AND Z-TRANSFORM (ZT) -** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping.

**MODULE 5: SAMPLING -** Mathematical theory of sampling. Sampling theorem. Ideal & Real sampling. Interpolation technique for the reconstruction of a signal from its samples. Aliasing. Sampling in freq. domain. Sampling of discrete time signals. Discrete time processing of Continuous-time signals, continuous time processing of discrete-time signals, changing the sampling rate using discrete-time processing.

**Text/Reference Books:**

1. Signals and Systems by J.P.Agrawal, Paragon International New delhi
2. Principles Of Linear Systems And Signals, 2e (Intl. Version), Lathi 2nd, Oxford
3. Signal & Systems 3e, Chen 3rd, Oxford
4. Signals And Systems, P Rao, TMH
5. Signals And Systems: A Simplified Approach, Ganesh Rao, 4e, Pearson
6. Signals And Systems: Continuous And Discrete, Roger E Ziemer, 4e, PHI

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEE 406 : ELECTRICAL AND ELECTRONICS MEASUREMENT AND INSTRUMENTATION LAB

**0L-0T-2P-1C** **MM 100**

1. Calibration of ac voltmeter and ac ammeter;
2. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.;
3. Measurement of Earth resistance using fall of potential method and low resistance by Kelvin‟s double bridge
4. Measurement of voltage, current and resistance using dc potentiometer;
5. Measure unknown inductance capacitance resistance using Anderson Bridge
6. Measure unknown inductance capacitance resistance using Maxwell Bridge
7. Measurement of capacitance by De Sauty bridge and Schering bridge;
8. Measurement of temperature by RTD, thermocouple and thermistor;
9. Measurement of displacement using LVDT, strain gauge based displacement transducer and strain gauge based load cell;
10. Measurement of flow rate by anemometer;

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 407 MICROPROCESOR & INTERFACING LAB

**0L-0T-2P-1C** **M.M.100**

1. Study the hardware, functions, memory structure and operation of 8085 microprocessor kit.
2. Program to perform integer division: (i) 8-bit by 8-bit (ii) 16-bit by 8-bit.
3. Transfer of a block of data in memory to another place in memory in the direct and reverse order.
4. Searching a number in an array and finding its parity.
5. Sorting of array in: (i) Ascending (ii) Descending order
6. Programme to perform following conversion: (i) BCD to ASCII (ii) BCD to Hexadecimal
7. Programme to multiply two 8-bit numbers.
8. Programme to generate and sum 15 Fibonacci numbers.
9. Programme for rolling display of message "INDIAN".
10. To insert a number at correct place in a sorted array.
11. Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
12. Generation of different waveform on 8253/ 8254 programmable timer.

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 408 ANALOG INTEGRATED CIRCUIT LAB

**0L-0T-2P-1C** **M.M.100**

1. Measurement of Op-amp Parameters. (Open Loop Gain, Input offset Voltage, CMRR, Slew rate).
2. Determination of Frequency response of Op-Amp.
3. To study and determine the characteristics of the Precision Rectifier.
4. To study and determine the characteristics of the Instrumentation Amplifier.
5. To study and determine the characteristics of the Open Loop operation of Op-amp - Comparators - Schmitt Trigger.
6. To study and determine the characteristics of the Astable & Monostable Operation Using 555.
7. To study and determine the characteristics of the IC Voltage Regulator.
8. To study and determine the characteristics of the Voltage Controlled Oscillator.
9. To study and determine the characteristics of the Phase Locked Loop.
10. To study and determine the characteristics of the Frequency Multiplier.
11. To study and determine the characteristics of the A/D Converters & D/A Converters.
12. To study and determine the characteristics of Second Order Active Filter- High Pass& Low Pass Realization.

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 409 ANALOG COMMUNICATION LAB

**0L-0T-2P-1C** **M.M.100**

1. Harmonic analysis of a square wave of a modulated wave form.

2. Observe the Amplitude modulated wave form & measure modulation index. Demodulation of AM signal.

3. Generation & Demodulation of DSB – SC signal.

4. Modulate a sinusoidal signal with high frequency carrier to obtain FM signal. Demodulation of the FM signal.

5. To observe the following in a transmission line demonstrator kit :

(a) The propagation of pulse in non-reflecting transmission line.

(b) The effect of losses in transmission line.

(c) Transmission with standing waves on a Transmission line.

(d) The resonance characteristics of a half-wave length long X-mission line.

6. (a) To observe the operation of sampling and sample & hold circuits.

(b) To study the effect of sampling time (sampling pulse width).

(c) To study the effects of changing the sampling frequency & observing aliasing phenomena.

7. To study & observe the operation of a super heterodyne receiver.

8. To study & observe the amplitude response of automatic gain controller (AGC).

9, 10. PAM, PWM & PPM: Modulation and demodulation.

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## BEC 410 SIGNAL PROCESSING LAB USING MAT LAB-I

**0L-0T-2P-1C** **M.M.100**

**Simulation in MATLAB Environment:**

1. Generation of continuous and discrete elementary signals (periodic and non-periodic) using mathematical expression.
2. Generation of Continuous and Discrete Unit Step Signal.
3. Generation of Exponential and Ramp signals in Continuous & Discrete domain.
4. Continuous and discrete time Convolution (using basic definition).
5. Adding and subtracting two given signals. (Continuous as well as Discrete signals)
6. To generate uniform random numbers between (0, 1).
7. To generate a random binary wave.
8. To generate random sequences with arbitrary distributions, means and variances for following

(a) Rayleigh distribution

(b) Normal distributions: N(0,1).

(c) Gaussion distributions: N (mx, óx2)

9. To plot the probability density functions. Find mean and variance for the above distributions

**Semester IV** **B.Tech in Electronics & Communication Engineering**

## MGT 202 BASIC PROGRAM IN ENTERPENEURSHIP

**0L-0T-2P-1C** **M.M.100**

**Objective:** The goal of this Program is to provide a space and platform for discovery, both self – discovery and opportunity discovery. Students will discover their strengths in terms of an entrepreneurial founding team and learn basics such as opportunity discovery, prototyping, business plans, challenges etc.

**Module 1:** Identification and classification of ideas. Entrepreneurial opportunities, environment scanning, Market assessment.

**Module 2: Clarifying** the Value Proposition, Product and Service; Market segmentation, Product Life cycle; BCG Matrix.

**Module 3:** Environmental Scanning and SWOT analysis; Components of an ideal business plan – market plan, financial plan, operational plan, and HR plan.

**Module 4:** Concept to Creation, Teething Problems of startup, Organizing and Marketing a Startup Selling on the web, launching e-commerce, Starting and growing an Enterprise, Growth Path

**Module 5:** Students have to prepare a detailed business plan selecting a product(s), Presentation of such business plans and submission after necessary corrections suggested by subject faculty

### References:

Online Courses through MOOC, Classroom learning through an experienced Facilitator/Faculty on campus (Games, Exercises, Videos, and Practical Experiences)

1. Tendon ,C: Environment and Entrepreneur; Cliugh Publications, Allahabad.
2. Siner A David: Entrepreneural Megabuks; John Wiley and Sons, New York.
3. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.
4. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.
5. Paudey I.M: Venture Capital - The Indian Experience; Prentice Hall of India. New Delhi
6. Holt: Entrepreneurship-New Venture Creation; Prentice Hall of India. New Delhi

**Semester IV** **B.Tech in Electronics & Communication Engineering**

**MGT 110 : GENERAL APTITUDE**

**0L-0T-2P+1C** **MM 100**

**MODULE-1 LEVEL 1:-** Number System:-Number Series, HCF and LCM of Numbers, Fractions and Decimals, Square Root and Cube Roots, Indices and Surds, Simplification and Approximation,

**MODULE-2-LEVEL-2** Problems on Ages and Numbers Percentage, Profit, Loss and Discount, Average, Ratio and Proportion, Time, Work and Wages, Pipes and Cisterns, Simple Interest, Compound Interest,

**MODULE-3-LEVEL-3** Growth and Depreciation, Time and Distance, Trains, Boats and Streams, Races, Clocks, Calendar

**MODULE-4 : LEVEL-4:** Area of Plane Figures, Volume and Surface Area of Solid Figures Elementary Algebra, Linear Equations, Quadratic Equations and In-equation, Progression,

**MODULE-5: LEVEL-5:** Permutation and Combination, Probability, Geometry, Trigonometry, **D**ata Interpretation, Data Sufficiency

**Text/Reference Books:**

1. R. S. Agarwal- Aptitude Mathematics
2. Mathuria- Quicker Mathematics

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEC 501 LINEAR INTEGRATED CIRCUITS

**3L-1T-0P-3.5C** **M.M. 100**

**MODULE 1: INTRODUCTION OF 741 IC -** Basic differential amplifier analysis, Single ended and double ended configurations, Op-amp configurations with feedback, Op-amp parameters, Inverting and Non-Inverting configuration**.**

**MODULE 2: APPLICATIONS OF 741 IC -** Integrator, Differentiator, Voltage to frequency & Frequency to voltage converters. Oscillators: Phase shift, Wien bridge, Quadrature, square wave, triangular wave, sawtooth oscillators. Voltage controlled oscillators. , Comparators, Adder,Subtractor.

**MODULE 3: FILTERS -** Low pass, high pass, band pass and band reject filters, All pass filter, Switched capacitor filter, Butterworth filter design.

**MODULE 4: PHASE-LOCKED LOOPS & ITS APPLICATIONS -** Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM 565 PLL.

**MODULE 5: LINEAR IC'S -** FOUR quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators. The 555 timer as astable and monostable multivibrators. Zero crossing detector, Schmitt trigger.

**Text/Reference Books:**

1. Linear Circuits (Includes Cd), Ramakalyan-, Oxford
2. Linear Circuit Analysis, Decarlo, Oxford
3. Linear Integrated Circuits, Nair, Wiley
4. Analysis And Design Of Analog Integrated Circuits, Gray, 5e, Wiley
5. Analog Mos Integrated Circuits For Signal Processing-Gregorian, Gregorian, 1e, Wiley
6. Linear Integrated Circuits, S Salivahanan, TMH
7. Electronic Circuits: Discrete And Integrated, Donald Schilling, TMH
8. Op-Amps And Linear Integrated Circuits, Gayakwad, Ramakant A, PHI

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEE 501 POWER ELECTRONICS

**3L-1T-0P-3.5C** **M.M. 100**

**MODULE 1: POWER SEMICONDUCTORS: -** Construction and characteristics, specification and ratings, of SCR, TRIAC, MOSFET, IGBT and Power Transistor. Triggering Method of SCR, Protection of SCR- Protection against over voltage, over current, dv/dt, di/dt, Gate protection. Methods of turn on of SCR : R, RC, UJT relaxation oscillator, Drive snubber circuits for MOSFET and Turn-on and turn-off characteristics and switching losses.

**MODULE 2: - PHASE-CONTROLLED CONVERTERS -** 2-pulse, 3-pulse and 6-pulse converters with R, RL and RLE load, Effect of freewheeling diode, Effect of source inductance, Distortion and displacement factor, Ripple factor.

**MODULE 3: - DC TO DC CONVERTERS -** Step-down and step-up choppers – Type A, B, C, D, and E Chopper, Time ratio control and current limit control, Switching mode regulators: Buck, boost, buck-boost and buck converter. Voltage commutated chopper and current commutated chopper.

**MODULE 4: - INVERTERS -** Single phase and three phase (both 120 and 180 degree mode) inverters – PWM techniques: Sinusoidal PWM, modified sinusoidal PWM and multiple PWM – Voltage and harmonic control - Series resonant inverter - Current source inverters.

**MODULE 5: - AC TO AC CONVERTERS -** Single – phase AC voltage controllers, Integral cycle control, single Phase step up and step down cycloconverters (continuous and discontinuous mode), Three phase cycloconvertor- three phase to single phase convertor, three phase to three phase convertor, output voltage equations.

**Text/Reference Books:**


1. Power Electronics: Circuits, Devices and Applications, Muhammad H. Rashid, Pearson Education, Third edition, 2004 / PHI.
2. Power Electronics: Converters, Applications and Design, Ned Mohan, John Wiley and sons, third edition, 2003.
3. Power Electronics, Cyril.W.Lander, McGraw Hill International, Third edition, 1993.
4. Modern Power Electronics and AC Drives, Bimal K. Bose, ' Pearson Education, 2003.
5. Introduction to Power Electronics, Mr. Jaganathan, ' Prentice Hall of India, 2004.
6. Power Electronics M D Singh and K B Khanchandani, TMH, 2008.
7. Elements of Power Electronics, Krein P. T, Oxford.
8. Power Electronics, P C Sen, Tata McGraw-Hill, India.
9. Power Electronics, C W Lander, McGraw Hill
10. Power Electronics and Motor Control, W Shepherd, Cambridge Uni. Press.

**Semester V** **B.Tech in Electronics & Communication Engineering**

**BEE 502 CONTROL SYSTEMS ENGINEERING**

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION:** Elements of control systems, concept of open loop and closed loop systems., Examples and application of open loop and closed loop systems, brief idea of multivariable control systems.

**MODULE 2: MATHEMATICAL MODELING OF PHYSICAL SYSTEMS:** Representation of physical system (Electro Mechanical) by differential equations, Determination of transfer function by block diagram reduction techniques and signal flow method, Laplace transformation function, inverse Laplace transformation.

**MODULE 3: TIME RESPONSE ANALYSIS OF FIRST ORDER AND SECOND ORDER SYSTEM:** Characteristic equations, response to step, ramp and parabolic inputs, transient response analysis, steady state errors and error constants, Transient & steady state analysis of LTI systems.

**MODULE 4: STABILITY OF THE SYSTEM:** Absolute stability and relative stability, Routh's stability criterion, root locus method of analysis, polar plots, Nyquist stability criterion. M and N Loci, Nichols chart.

**MOUDLE 5: ELEMENTARY IDEAS OF COMPENSATION, NETWORKS:** Lag, lead and log lead networks, brief idea of proportional, derivative and integral controllers.
.

**Text/Reference Books:**


1. Modern Control Engineering, K. Ogata, '4th edition, Pearson Education, New Delhi, 2003 / PHI.
2. Control Systems Engineering, I.J. Nagrath& M. Gopal New Age International Publishers, 2003.
3. Automatic Control Systems, B.C. Kuo, Prentice Hall of India Ltd., New Delhi, 1995.
4. Control Systems, Principles & Design, M. Gopal, Tata McGraw Hill, NewDelhi, 2002.
5. Control Engineering Theory and Practice, M.N. Bandyopadhyay, Prentice Hallof India,

**Semester V** **B.Tech in Electronics & Communication Engineering**

**BEC 502 MICROCONTROLLER & EMBEDDED SYSTEM**

**3L-0T-0P-3C** **M.M. 100**

**Module 1: INTRODUCTION TO VARIOUS MICROCONTROLLER -** Overview of Embedded System: Definition, Design Challenges and Characteristics, Difference between microprocessor, microcontroller, introduction of various microcontrollers, 8051 By Intel, PIC by Microchip, AVR by ATMEL, ARM by ARM, MSP430 by Texas, Use and application of 8051 .

**Module 2 : 8051 MICRO CONTROLLER -** 8051 Microcontroller: Architecture, Addressing modes, I/O Port Programming, Single bit, Instructions and Programming

**Module 3 : 8051 PROGRAMMING -** Interrupt Programming, Timers Programming, serial port Programming and interrupt programming in Assembly and C .

**Module 4 : ARM PROCESSORS -** ARM Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector table, Core Extensions, Instruction Set, Introduction to Thumb Instruction Set (Writing Programs not included in the theory Course)

**Module 5 : APPLICATIONS OF EMBEDDED SYSTEMS -** Concepts of system-on-chip, How modern-day system-on-chip (SoC) microcontrollers can Implement a whole signal chain. Applications of Embedded systems: Energy meters, Smoke detectors, Data acquisition system, wired sensor network, and wireless sensor networks with Chipcon RF interface.

**Text/Reference Books:**

1. Andrew N. Sloss et.al. ARM System Developers Guide, ELSEVIER
2. Muhammad Ali Mazidi et.al., The 8051 Microcontroller & Embedded Systems, Pearson
3. Embedded System Design, A Unified Hardware/Software Introduction, Frank
4. Vahid / Tony Givargis, 2006 reprint, John Wiley Student Edition.
5. Muhammad Ali Mazidi et.al., The PIC Microcontroller, Pearson

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEC 503 DESIGN OF DIGITAL CONTROL SYSTEM

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION TO DISCRETE TIME CONTROL SYSTEM-** Basic building blocks of Discrete time Control system, Sampling Theorem, Z transform and Inverse Z transform for applications for solving differential equations, Mapping between the S-plane and the Z-plane, Impulse sampling and Data Hold

**MODULE 2: PULSE TRANSFER FUNCTION AND DIGITAL PID CONTROLLERS-** The pulse transfer function, pulse transfer function of Closed Loop systems, Pulse transfer function of Digital PID controller, Velocity & Position forms of Digital PID Controller, Realization of Digital Controllers, Deadbeat response and ringing of poles

**MODULE 3: DESIGN OF DISCRETE TIME CONTROL SYSTEM BY CONVENTIONAL METHODS-** Stability analysis in Z-plane, Jury stability criterion, Bilinear transformations,Design based on the root locus method, Digital Controller Design using Analytical Design Method

**MODULE 4: STATE SPACE ANALYSIS OF DISCRETE TIME CONTROL SYSTEM-** State space representation of discrete time systems, Solution of discrete time state space equations, Pulse transfer function matrix, Eigen Values, Eigen Vectors and Matrix Diagonalization

**MODULE 5: POLE PLACEMENT AND OBSERVER DESIGN**- Concept of Controllability and Observability, Useful transformations in state space analysis and design, Stability improvement by state feedback, Design via pole placement, State observers
**Optimal Control:** Quadratic Optimal Control and Quadratic performance index, optimal state regulator through the matrix riccati equations, Steady State Quadratic Optimal Control.

**Text/Reference Books:**

1. Discrete Time Control systems by K. Ogata, Prentice Hall, Second Edition.
2. Digital Control and State Variable Methods by M. Gopal, Tata McGraw Hill.
3. B. C. Kuo, Digital Control Systems, Oxford University Press, 2/e, Indian Edition
4. Digital control of Dynamic Systems by G.F.Franklin, J.David Powell, Michael Workman 3rd Edition, Addison Wesley .
5. Digital Control Engineering by M. Gopal, Wiley Eastern Ltd.
6. Digital Control by Kannan Moudgalya, John Wiley and Sons.

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEC 504 ADVANCED MICROPROCESSOR

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: 80186, 80286, 80386 AND 80486 MICROPROCESSORS** Architecture of 80186/ 80286/80386/80486, Enhancements of 80186, Real & Virtual Addressing Modes, Cache Memory, Special Registers, Memory Management, Memory Paging Mechanism, Exception Handling, Comparison of Microprocessors (8086 – 80186 –80286 – 80386 – 80486)

**MODULE 2: PENTIUM MICROPROCESSORS:** Pentium Microprocessor Architecture, Special Pentium Registers, Pentium Memory Management, New Pentium Instructions, Pentium Pro Microprocessor, Microprocessor Architecture of Pentium II Microprocessor Architecture of Pentium III, Microprocessor Architecture of Pentium IV, Comparison of Pentium Processors.

**MODULE 3: RISC PROCESSORS I:** PowerPC620 – Instruction fetching – Branch Prediction – Fetching – Speculation, Instruction dispatching –dispatch stalls – Instruction Execution – Issue stalls- Execution Parallelism – Instruction completion – Basicsof P6 micro architecture – Pipelining – our- of-order core pipeline – Memory subsystem.

**MODULE 4: RISC PROCESSORS II(SUPERSCALAR PROCESSORS):** Intel i960 – Intel IA32- MIPS R8000 – MIPS R10000 – Motorola 88110 – Ultra SPARC processor- SPARC version 8 – SPARC version 9.

**MODULE5:PC HARDWARE OVERVIEW :**Functional Units & Interconnection, New Gene ration Mother Boards 286 to Pentium 4, Bus Interface- ISA- EISA- VESA- PCI- PCIX. Peripheral Interfaces & Controllers, Memory and I/O Port Addresses.

**Text/Reference Books:**


1. B.B.Brey The Intel Microprocessor 8086/8088 /80186/80188, 80286, 80386, 80486
2. PENTIUM, PENTIUM Pro, PII, PIII & IV Archietecture, Programming & Interfacing, Pearson E ducation ,2004.
3. John Paul Shen, Mikko H.Lipasti, “Modern Processor Design”, Tata Mcgraw Hill, 2006.
4. Douglas V.Hall, “Microprocessors and Interfacing”, Tata McGraw Hill, II Edition2006

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEC 505 TELECOMMUNICATION ENGINEERING

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1 : TRANSMISSION LINE :** Types of transmission lines, general transmission line equation, line constant, equivalent circuits, infinite line, and reflection on a line, SWR of line with different type of terminations. Distortion less and dissipation less lines, Coaxial cables, Transmission lines at audio and radio frequencies, Losses in transmission line,. Characteristics of quarter wave, half wave and lines of other lengths,

**MODULE 2 :TRANSMISSION LINE APPLICATIONS -** Smith chart and its application. Transmission line applications, Impedance matching Network. Single & double Stub matching. Measurement of parameters of transmission line, measurement of attenuation, insertion loss, reflection coefficient and standing wave ratio.

**MODULE 3 : ATTENUATORS & FILTERS -** Elements of telephone transmission networks, symmetrical and Asymmetrical two port networks. Different Attenuators, π-section & T-section attenuators, stub matching, Transmission equalizers Filters, constant K-section, Ladder type, π-section, T-section filter, m-derived filter sections, Lattics filter section.

**MODULE 4 : TELEPHONE TRANSMISSION -** Telephone set, Touch tone dial types, two wire/ four wire transmission, Echo suppressors & cancellors, cross talk. Multi-channel systems: Frequency division & time division multiplexing.

**MODULE 5 : AUTOMATIC TELEPHONY & TELEGRAPHY -** Trunking concepts, Grade of service, Traffic definitions, Introduction to switching networks, classification of switching systems. Principle of Electronic Exchange, EPABX and SPC Digital telephone Exchange, Numbering plan, Fascimile

**Text/Reference Books:**

1. W. Fraser – Telecommunications (BPB Publication)
2. Vishwanathan – Telecommunication switching systems & Networks, PHI
3. Cole – Introduction to Telecommunication, Pearson Education.
4. Umesh Sinha “Telecommunication”, laxmi pub.

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BCS 511 PROGRAMMING IN JAVA

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: JAVA** - Introduction to Object Orientated Programming, Abstraction, Object Oriented Programming Principles, Features of JAVA, Introduction to Java byte code, Java Virtual machine.

**Program Elements:** Primitive data types, variables, assignment, arithmetic, short circuit logical operators, Arithmetic operators, bit wise operators, relational operators, Boolean logic operators, the assignment operators, operator precedence, Decision and control statements, arrays.

**MODULE 2: CONTROL STATEMENTS** - Java's Selection Statements, if statement, switch statement, Iteration Statements, while, do-while, for, for-each, Nested Loops, Jump Statements, Using break, Using continue, return.

**MODULE 3: OBJECTS AND CLASSES** - Objects, constructors, returning and passing objects as parameter, Nested and inner classes, Single and Multilevel Inheritance, Extended classes, Access Control, usage of super, Overloading and overriding methods, Abstract classes, Using final with inheritance.

PACKAGE AND INTERFACES: Defining package, concept of CLASSPATH, access modifiers, importing package, Defining and implementing interfaces.

**MODULE 4: STRING HANDLING** - String constructors, special string operations, character extraction, searching and comparing strings, string Buffer class.

EXCEPTION HANDLING: Exception handling fundamentals, Exception types, uncaught exceptions, try, catch and multiple catch statements. Usage of throw, throws and finally .FILE HANDLING: I/O streams, File I/O.

**MODULE 5: CONCURRENCY** - Processes and Threads, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Joins, Synchronization. APPLET: Applet Fundamentals, using paint method and drawing polygons.

**Text/Reference Books:**

1. Herbert Schildt: JAVA 2 - The Complete Reference, TMH, Delhi
2. Deitel: How to Program JAVA, PHI
3. U.K. Chakraborty and D.G. Dastidar: Software and Systems – An Introduction, Wheeler Publishing, Delhi.
4. Joseph O'Neil and Herb Schildt: Teach Yourself JAVA, TMH, Delhi.

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BCS 401 DATABASE MANAGEMENT SYSTEMS

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION** - Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management, Decision Support Systems, Components of a Database management System. Distributed Processing and Client- Server Architecture. Entity-Relationship Model – Basic Concepts, Constraints, Keys, Design Issues, E-R Diagrams.

**MODULE 2: RELATIONAL MODEL** - Structures of relational databases, Integrity Constraints, Logical database Design, Tables, Views, Data Dictionary. Relational Algebra, Relational Calculus. SQL – Basic Structures, Query Handling, Embedded SQL, Open Database Connectivity (ODBC), Java Database Connectivity (JDBC), Triggers, Security and Authorization. Query By Example (QBE), User Interfaces and Tools, Forms and Graphical User Interfaces. Report Generators. Overview of Relational Query Optimization.

**MODULE 3: RELATIONAL DATABASE DESIGN** - Functional Dependencies, Multi-valued Dependencies, Normal Forms, Decomposition into Normalized Relations, Physical Database Design – File Structures. Object-Relational Databases – Nested Relations, Complex Data types, Object-Relational Features in SQL:1999.

**MODULE 4: INTERNET DATABASES** - World Wide Web, Client Side Scripting and Applets, Web Servers and Sessions, Services, Server Side Scripting. XML – Structure of XML Data, XML Document Schema, XQuery, Storage of XML Data, XML Applications.

**MODULE 5: ADVANCED TOPICS** - Fundamental Concepts of Transaction Management, XConcurrency Control, Recovery Systems, Data Analysis and OLAP. Introduction to Data Mining, Data Farming, Data Warehousing, Spatial and Geographic Databases, Temporal databases a,d Multimedia Databases.

**Text / Reference Books:**

1. Date C J, " An Introduction to Database Systems", Addision Wesley
2. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fudamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.
5. Leon & Leon,"Database Management Systems", Vikas Publishing House
6. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
7. Majumdar & Bhattacharya, "Database Management System", TMH (14)
8. Ramkrishnan, Gehrke, " Database Management System", McGraw Hill
9. Kroenke, " Database Processing Fundamentals , Design and Implementation" Pearson Education.
10. D.Ulman, "Principles of Database and Knowledge base System", Computer Science Press.
11. Maheshwari Jain.'DBMS: Complete Practical Approach", Firewall Media, New Delhi

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BCS 501 OPERATING SYSTEM

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION** - OS Concepts – Evolution of OS, OS Structures- Kernel, Shell, General Structure of MSDOS, Windows 2000, Linux. Introduction- UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards. Introduction and need of operating system, layered architecture/logical structure operating system, Type of OS, operating system as resource manager and virtual machine, OS services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader.

**MODULE 2: PROCESS MANAGEMENT** - Process & Threads – Process States - Process Control Block. Process Scheduling – Operations on Processes, Threads, CPU Scheduler – Preemptive and Non-Preemptive; Dispatcher, Scheduling Criteria, Scheduling Algorithms – Process Management in UNIX.

**UNIX Processes -** The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. Process Control

**MODULE 3: MEMORY MANAGEMENT -** Objectives and functions, Simple Resident Monitor Program (No design), Overlays – Swapping; Schemes – Paging – Simple, Multi-level Paging; Internal and External Fragmentation; Virtual Memory Concept, Demand Paging - Page Interrupt Fault, Page Replacement Algorithms; Segmentation – Simple, Multi-level, Segmentation with Paging, Memory Management in UNIX.

**MODULE 4: INTER PROCESS COMMUNICATION:- 1.Virtual Memory**– Concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, 2: Overview of IPC Methods, Pipes, popen, close Functions, Co-processes, FIFOs, System V IPC, Message Queues, Semaphores. Inter-process Communication – 3: Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

**MODULE 5: INFORMATION MANAGEMENT** - Files and Directories – Directory Structure – Directory Implementation – Linear List - Hash Table. Device Management: Dedicated, Shared and Virtual Devices - Serial Access Devices, Direct Access Devices, Direct Access Storage Devices – Channels and Control Units – Disk Scheduling methods.

**Text/Reference Books:**

1. Operating Systems Concepts – Silberschatz, Galvin, Wiley Publications (2008)
2. Modern Operating Systems - Andrew S. Tenenbaum, Pearson Education Asia / PHI (2005)
3. UNIX System Programming Using C++,by Terrence Chan: Prentice Hall India, 1999.
4. Advanced Programming in UNIX Environment, by W. Richard Stevens: 2nd Ed, Pearson Education, 2005.
5. Operating Systems – William Stallings, Pearson Education Asia (2002)

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEC 506 LINEAR INTEGRATED CIRCUIT LAB

**0L-0T-2P-1C** **M.M. 100**

**To design the following circuits, assemble these on bread board and test them.**
**Simulation of these circuits with the help of appropriate software.**

1. Op-Amp characteristics and get data for input bias current measure the output-offset voltage and reduce it to zero and calculate slew rate.
2. Op-Amp in inverting and non-inverting modes.
3. Op-Amp as scalar, summer and voltage follower.
4. Op-Amp as differentiator and integrator.
5. Design LPF and HPF using Op-Amp 741
6. Design Band Pass and Band reject Active filters using Op-Amp 741.
7. Design Oscillators using Op-Amp (i) RC phase shift (ii) Hartley (iii) Colpitts
8. Design (i) Astable (ii) Monostable multivibrators using IC-555 timer
9. Design Triangular & square wave generator using 555 timer.
10. Design Amplifier (for given gain) using Bipolar Junction Transistor

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEE 506 POWER ELECTRONICS LAB

**0L-0T-2P-1C** **M.M. 100**

1. Study of characteristics of the SCR (a) observe the terminal configuration (b) measure the breakdown voltage (3) measure the latching and holding current (d) plot V-I characteristics
2. Study the performance of single-phase half-wave and full-wave controlled rectifiers.
3. Study different firing circuits of SCR.
4. Study and perform Buck, Boost, and Buck boost regulator
5. Study protection circuits of SCR: (i) dv/dt (ii) di/dt (iii) Over voltage (iv) Over current
6. Study and obtain the characteristics of a DIAC and TRIAC.
7. Study firing circuit of SCR using ramp-comparator scheme.
8. Study firing circuit of SCR using cosine-wave scheme.
9. Study and obtain waveform for voltage and current commutated chopper
10. Study and perform experiments on single phase PWM Invertor.

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEC 507 ADVANCED MICROPROCESSOR LAB

**0L-0T-2P-1C** **M.M. 100**

1. To write and simulate ARM assembly language programs for data transfer, arithmetic and logical operations.
2. To write and simulate C Programs for ARM microprocessor in KEIL
3. To interface LED with ARM microprocessor and write program to blink LED at the interval of 1 second
4. To interface switch with ARM microprocessor and write program in C language to read status of the switch
5. To interface LCD with ARM microprocessor. Write and execute programs in C language for displaying text messages and numbers on LCD
6. To interface DC motor with ARM microprocessor. Write program to rotate DC motor in clockwise and anticlockwise direction with different speed.
7. To interface Stepper motor with ARM microprocessor. Write program to rotate motor in half step and full step mode
8. To write programs for ARM microprocessor using optimization techniques and compare execution time.
9. To implement convolution of two sequences on ARM microprocessor using assembly or C language
10. Interfacing of temperature sensor with ARM freedom board (or any other ARM microprocessor board) and display temperature on LCD

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BEC 508 MICROCONTROLLER & EMBEDDED SYSTEM LAB

**0L-0T-2P-1C** **M.M. 100**

1. Flash a LED connected at a specified output port terminal
2. Interface a stepper motor – and rotate it clock wise or anti clock wise through
3. given angle steps
4. Using Keil software write a program to pick the smallest among a given set of numbers
5. Using Keil software write a program to pick the largest among a given set of numbers
6. Using Keil software write a program to arrange a given set of numbers in descending order
7. Using Keil software write a program to generate a rectangular wave form at a specified port terminal
8. Pseudo Random Binary Sequence (PRBS) and Sequence Generators using Shift registers
9. Digital I/O Experiments Using the Logic Interface Card of the 8085 Microprocessor Kit
10. Interface Experiments Using Dual DAC Card of the 8085 Microprocessor Kit

**Semester V** **B.Tech in Electronics & Communication Engineering**

**BCS 508 PROGRAMMING IN JAVA LAB**

**0L-0T-2P-1C** **M.M. 100**

**Programs in JAVA:**

1. Creation of classes and use of different types of functions.
2. Count the number of objects created for a class using static member function.
3. Write programs on interfaces.
4. Write programs on packages.
5. Write programs using function overloading.
6. Programs using inheritance
7. Programs using IO streams.
8. Programs using files.
9. Write a program using exception handling mechanism.
10. Programs using AWT
11. Programs on swing.
12. Programs using JDBC

**Semester V** **B.Tech in Electronics & Communication Engineering**

**BCS 404 DATABASE MANAGEMENT SYSTEMS LAB**

**0L-0T-2P-1C** **M.M. 100**

Student can use My Sql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. **(a)** Write a C++ program to store students records (roll no, name, father name) of a class using file handling.(Using C++ and File handling).
   **(b)** Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.
   **(a)** Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.
   **(b)** Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query.
   (Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).
   **(a)** Write a query to display name and age of given id (id should be asked as input).
   **(b)** Write a query to display average age of all students.
   **(c)** Write a query to display mark-sheet of any student (whose id is given as input).
   **(d)** Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

**Semester V** **B.Tech in Electronics & Communication Engineering**

## BCS 506 OPERATING SYSTEM LAB

**0L-0T-2P-1C** **M.M. 100**

1. Shell programming
   - command syntax
   - write simple functions
   - basic tests
2. Shell programming
   - loops
   - patterns
   - expansions
   - substitutions
3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Given the list of processes, their CPU burst times and arrival times,display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time
7. Given the list of processes, their CPU burst times and arrival times,display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time
8. Implement the Producer – Consumer problem using semaphores.
9. **Implement some memory management schemes – I** for eg Free space is maintained as a linked list of nodes with each node having the starting byte address and the ending byte address of a free block. Each memory request consists of the process-id and the amount of storage space required in bytes. Allocated memory space is again maintained as a linked list of nodes with each node having the process-id, starting byte address and the ending byte address of the allocated space.
10. **Implement some memory management schemes – II** for eg when a process finishes (taken as input) the appropriate node from the allocated list should be deleted and this free disk space should be added to the free space list. [Care should be taken to merge contiguous free blocks into one single block. This results in deleting more than one node from the free space list and changing the start and end address in the appropriate node]. For allocation use first fit, worst fit and best fit.

**Semester V** **B.Tech in Electronics & Communication Engineering**

## MGT 203 FOUNDATION PROGRAM IN ENTREPRENEURSHIP

**0L-0T-2P-1C** **M.M. 100**

**Objective:** This program will acquire the students with the skills required to take an idea to market.

**Module I: Customer Development and Experience** , understanding consumer behavior and needs , designing the product/service according to the market needs , how to create an experience and not just a service.

Mod**ule II: Project Formulation** – Steps involved in setting up a Business, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal.

**Module III:** Small, Medium And Large Industrial Sectors, Industrial Potential, Demand And Resource Based Industries, Service Sector, corporate entrepreneurship, entrepreneurship and technocrat entrepreneurship.

**Module IV**: Sources of finance for enterprises, angel investors and venture capitalists, banks and government institutions, policies for start-ups.

**Module V**.: Stakeholders Validation – test angel investor interest in the solution, pitching to others (investors, partners, potential key hires), obtaining seed funding and making the first key hires , validate interest for partners , channels.

**References:** Online courses through MOOC.

1. Tendon ,C: Environment and Entrepreneur; Cliugh Publications, Allahabad.
2. Siner A David: Entrepreneural Megabuks; John Wiley and Sons, New York.
3. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.
4. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.
5. Paudey I.M: Venture Capital - The Indian Experience; Prentice Hall of India. New Delhi
6. Holt: Entrepreneurship-New Venture Creation; Prentice Hall of India. New Delhi
7. World Bank Development report 2015-16.
8. World Bank "doing Business" 2014, 2015, 2016.
9. Govt. of India "Economic survey 2015-16", Oxford University Press
10. UNDP-Human Development Report 2015-16.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 601 MICROWAVE ENGINEERING

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: WAVE GUIDES AND COMPONENTS -** Introduction of Microwaves and their applications. Rectangular Waveguides, Solution of Wave equation in TE and TM modes. Power transmission and Power losses. Excitation of modes in Rectangular waveguides, circular waveguides: Basic idea of TE and TM modes, field patterns, TEM mode of propagation. Scattering matrix representation of networks. Rectangular cavity and circular cavity resonators. Waveguide Tees, Magic Tees. Hybrid rings. Waveguide corners, Bends and twists. Directional couplers, Circulators and isolators.

**MODULE 2: KLYSTRONS -** Limitation of conventional vacuum tubes, Construction and operation of two cavity & multicavity klystrons. Velocity modulation and electron bunching (analytical treatment), Applegate diagram and applications of two cavity klystrons. Construction, working and operation of Reflex klystron. Applications and practical considerations. Velocity modulation, power output and frequency characteristics of a Reflex klystron. Electron admittance.

**MODULE 3: TRAVELLING WAVE TUBES (TWT) -** Construction, operation and practical consideration of helix type TWT. Introduction to CW power, pulsed dual mode TWT. Coupled cavity TWT. Applications of TWT.

**MAGNETRON -** Types of Magnetron. Construction, operation, analysis and practical consideration of cavity or travelling wave magnetron. Introduction to coaxial, frequency angle and voltage tunable magnetrons. Backward cross field oscillator, Forward wave cross field amplifier.

**MODULE 4: MICROWAVE MEASUREMENTS -** Detection of microwaves, Microwave power measurement, Impedance measurement, Measurement of scattering parameters, Frequency measurement, VSWR measurements. Introduction to microstrip lines, Parallel striplines, Coplanar striplines, Shielded striplines, Slot lines, Integrated Fin line, Non-radiative guide, Transitions, Bends and Discontinuities.

**MODULE 5: MICROWAVE NETWORK ANALYSIS -** Impedance and Admittance matrices, Scattering matrix, Reciprocal networks and Loss less networks parameters, ABCD Matrix, Equivalent circuits for Two port Network, Conversions between two port network Signal flow graphs, Discontinuities in waveguides and microstrip.

**MICROWAVE SEMICONDUCTOR DEVICES -** Construction, Operation and Practical applications of PIN diode, varactor and Tunnel diode, Gunn diode, IMPATT, TRAPTT diodes, BJT, JFET, MESFET, CCD, MASER and LASER.

**Text/Reference Books:**

1. Foundations For Microwave Engineering – R.E. Collin, R.E. Collin, Wiley
2. Microwave Engineering By, Pozar, Wiley
3. Fundamental of Microwave Engineering, Anoop Singh Poonia & Seema Verma, PHI Learning Private Limited, New Delhi
4. Microwave Engineering, Annapurna Das, Sisir Das, TMH
5. Microwave Devices And Circuits, 3, Samuel Y. Liao, Pearson

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 602 DIGITAL COMMUNICATION

**3L-1T-0P-3.5C** **M.M. 100**

**MODULE 1: INTRODUCTION -** Source and signal, Model of digital communication, channel of digital communication, Type of Digital Signal. Sampling, Type of Sampling, Sampling Theorem for Low Pass and Band Pass Signals, Aliasing, Aperture Effect. **Pulse Modulation:** Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Channel Bandwidth for PAM-TDM Signal, Introduction to Pulse Position and Pulse Duration Modulation.

**MODULE 2: PULSE CODE MODULATION: DIGITAL SIGNAL -** Uniform and Non-uniform Quantization, Quantization Error, Pulse Code Modulation (PCM), Signal-to-Noise Ratio in PCM, Companding, Inter-symbol Interference, Differential PCM (DPCM), Delta Modulation (DM), and Adaptive Delta Modulation (ADM).

**MODULE 3: DIGITAL MODULATION TECHNIQUES -** Types of Digital Modulation Technique, Generation and Detection (Block Diagram), Spectrum and Bandwidth and probability of error of Amplitude Shift Keying (ASK), Binary Phase Shift Keying (BPSK), Binary frequency Shift Keying (BFSK), Differential Phase Shift Keying (DPSK), Offset and Non-offset Quadrature Phase Shift Keying (QPSK), M-ary PSK, M-ary FSK, Minimum Shift Keying, Quadrature Amplitude Modulation (QAM), Matched Filter, Optimum Filter.

**MODULE 4: SPREAD SPECTRUM MODULATION -** Introduction to Spread Spectrum modulation, Generation and Characteristics of p-n Sequences, Direct sequence Spread Spectrum System, Code Division multiple Access with DS-SS, Frequency Hopping Spread Spectrum Type of frequency hopping.

**MODULE 5: INFORMATION THEORY -** Information, Entropy, Mutual Information, Channel Capacity, Shannon Theorem, Shannon- Hartley theorem. Coding: Type of coding, Shannon fano coding, Huffman coding, Linear block code, Minimum distance, Systematic & Non- Systematic form, Convolution code, code tree, Trellis Diagram, & State Diagram

**Text/Reference Books:**


1. Taub and Schilling: Principles of Communication System, TMH
2. Simon Haykins: Communication Systems, 4th Edition, John Wiley.
3. Singh and Sapre: Communication System, TMH
4. B.P. Lathi: Modern Analog and Digital Communication System, Oxford University Press
5. Tomasi: Advanced Electronics Communication Systems, 6th Edition, PHI
6. Couch: Digital and Analog Communication, Pearson Education.
7. David Smith: Digital Transmission Systems, Springer- Macmillan India Ltd
8. Kennedy, Electronic Communication Systems, TMH
9. Ian Glover, Digital Communication, Pearson

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 603 DIGITAL SIGNAL PROCESSING

**3L-1T-0P-3.5C** **M.M. 100**

**MODULE 1: REALIZATION OF DIGITAL SYSTEMS -** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H(z), example of continued fraction, realization of a ladder structure, example of a ladder realization.

**MODULE 2: DESIGN OF INFINITE IMPULSE RESPONSE DIGITAL FILTERS -** Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev Design of Digital Butterworth and Chebyshev Filters.

**MODULE 3: FINITE IMPULSE RESPONSE FILTER DESIGN -** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows ,The Kaiser Window.

**MODULE 4: DISCRETE FOURIER TRANSFORMS -** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.

**MODULE 5: FAST FOURIER TRANSFORM ALGORITHMS -** Introduction, Decimation – In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency(DIF) Algorithm Application of DSP to Speech and Radar signal processing.

**Text/Reference Books:**

1. Digital Signal Processing, Sanjit K Mitra, TMH
2. Digital Signal Processing, S.Salivahanan A Vallavaraj, C.Gnanapriya, TMH
3. Digital Signal Processing: Principals, Algorithms And Applications, John G.Proakis, Dimitris G Manolakis, PHI
4. Digital Signal Processing, A.V. Oppenheim And R.W. Schaffer, PHI
5. Digital Signal Processing, Thomas J. Cavicchi, John Wiley & Sons
6. Digital Signal Processing, Emmanuel Ifeachor, Barry Jervis, Pearson
7. Digital Signal Processing, Chi-Tsong Chen, Oxford
8. Digital Signal Processing, Engelberg, Shlomo, Springer

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 604 CMOS DIGITAL INTEGRATED CIRCUIT

**3L-0T-0P-3C** **M.M. 100**

**Module 1: FABRICATION:-** Fabrication process Flow: Basic steps, Mos Fabrication process, CMOS Fabrication process.MOS Transistor Theory: Current-voltage characteristics of MOSFETS, threshold voltage and body effect, MOSFET design equations, second order effects-body effect, Channel Length Modulation. MOSFET Capacitances

**MODULE 2: NMOS AND CMOS INVERTER:** NMOS and CMOS inverters, W/L ratio for NMOS and CMOS inverters, β_n/β_p ratio, noise margin, NMOS and CMOS Voltage transfer Characteristics.

**MODULE 3: MOS INVERTER'S SWITCHING CHARACTERISTICS:** Calculation of delay times, Inverter design with delay constraints, CMOS Delay and power dissipation-static power dissipation dynamic power dissipation.

**MODULE 4: STICK DIAGRAM & LAYOUT:** Stick diagrams: basics, CMOS design style, design rules: lambda based design rules, layout design. Combinational MOS Logic circuits: CMOS logic structure:-CMOS complementary logic, pseudo NMOS logic, Dynamic CMOS logic, CMOS Transmission gate (pass gate)

**MODULE 5: INTRODUCTION TO VLSI SYSTEM DESIGN:** Generalized VLSI Design flow, HDL based VLSI Design flow, Introduction to Verilog, Advantages of Verilog, Design Methodology-Top Up and Bottom UP Design methodology,Verilog modeling- Gate level, Data flow, behavioral modeling, and examples.Sequential MOS Logic circuits-SR Latch NAND and NOR based JK Latch.

**Text/ Reference Books:**

1.Sung-Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis and Design, Tata Mc-Graw-Hill
2. Jab M. Rabaey, Anantha Chandra kasan, Borivoje Nikolic, Digital Integrated Circuits A Design Perspective, PHI.
3.Neil H.E. Weste, Kamrau Eshraghian, Principles of C-MOS VLSI Design A systems Perspective, Pearson Education
4.Douglas A. Pucknell & Kamran Eshraghian, Basic VLSI Design, PHI.
5.Michal John Sebastian Smith, Application-Specific Integrated Circuits, Pearson Education

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 605 MEMS & MICROSYSTEMS

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION TO MICROSYSTEMS:** Overview of microelectronics manufacture and Microsystems technology. Definition - MEMS materials. Laws of scaling. The multi disciplinary nature of MEMS. Survey of materials central to micro engineering. Applications of MEMS in various industries.

**MODULE 2: MICRO SENSORS AND ACTUATORS**: Working principle of Microsystems - micro actuation techniques - micro sensors – types – Microactuators – types – micropump – micromotors – micro – valves – microgrippers – microaccelerometers.

**MODULE 3: FABRICATION PROCESS**: Substrates - single crystal silicon wafer formation – Photolithography – Ion implantation – Diffusion – Oxidation – CVD - Physical vapor deposition - Deposition epitaxy - etching process.

**MODULE 4: MICRO SYSTEM MANUFACTURING :** Bulk Micro manufacturing - surface micro machining – LIGA – SLIGA - Micro system packaging materials - die level - device level - system level - packaging techniques – die preparation – surface bonding - wire bonding - sealing.

**MODULE 5: MICROSYSTEMS DESIGN AND PACKAGING**: Design considerations, Mechanical Design, Process design, Realization of MEMS components using intellisuite. Micro system packaging, Packing Technologies, Assembly of Microsystems, Reliability in MEMS.

**Text/ Reference Books:**

1. Mohamed Gad – el – Hak, "MEMS Handbook", CRC Press, 2002.
2. Rai - Choudhury P. "MEMS and MOEMS Technology and Applications", PHI Learning Private Limited, 2009.
3. Sabrie Solomon, "Sensors Handbook," Mc Graw Hill, 1998.
4. Marc F Madou, "Fundamentals of Micro Fabrication", CRC Press, 2nd Edition, 2002.
5. Francis E.H. Tay and Choong .W.O, "Micro fluidics and Bio mems application", IEEE Press New York, 1997.
6. Trimmer William S., Ed., "Micromechanics and MEMS", IEEE Press New York, 1997.
7. Maluf, Nadim, "An introduction to Micro electro mechanical Systems Engineering", AR Tech house, Boston 2000.
8. Julian W.Gardner, Vijay K.Varadan, Osama O. Awadel Karim, "Micro sensors MEMS and Smart Devices", John Wiby & sons Ltd., 2001

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 606 NEURO FUZZY SYSTEMS

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION TO FUZZY AND NEURO-FUZZY SYSTEM**: Merits of Fuzzy and Neuro Fuzzy systems. Introduction to Architecture of a Fuzzy system. Fuzzification Rule Base Inference engine, defuzzizication.
**FUZZY MATHEMATICS**: Fuzzy sets and operations of fuzzy sets, properties of fuzzy sets, fuzzy relations, fuzzy graphs & Fuzzy arithmetic.

**MODULE 2: ARCHITECTURE AND DESIGN ISSUES:** Fuzzification , fuzzy Rule- Base and Fuzzy – Rule Based models – implication process, defuzzification Techmiques.
ANALOG DESIGN OF FUZZY PROCESSORS : Modular design , design of a fuzzifier , knowledge base and inference engine , defuzzifier design.

**MODULE 3: IMPLEMENTATION OF A COMPLETE ANALOG FUZZY SYSTEMS**: Design and microprocessor based implementation of fuzzysystems.

**MODULE 4: FUZZY MODEL IDENTIFICATION**: Structure Specifications, Parameter estimation, model validation.

**MODULE 5: NEURO FUZZY SYSTEMS**: Introduction to Neural Networks , Neuro Fuzzy Architecture , Learning methodologies , genetic Algorithum , neural networks in communications.

**Text/Reference Book:**

1. Klir & Yuan , Fuzzy Sets and Fuzzy Logic.
2. Chin – Teng Lin & Lee C S G Neural Fuzzy Systems , Prentice Hall International.
3. Bose N K , Liang P , Neural Networks Fundamentals with graphs , Algorithm and Applications , Tata McGraw Hill.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

**BEC 607 COMPUTER NETWORK AND DATA COMMUNICATION**

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION** - OSI, TCP/IP and other networks models, Network Topologies WAN, LAN, MAN.Token Bus, Token Ring, FDDI, IEEE standards 802.2, 802.3 Hubs, Bridges, Routers Gateways, Transmission Media: Transmission of signals through Twisted pair, Coaxial cable, optical fibre(SM, MM, Graded Index).

**MODULE 2: II DATA LINK LAYER & MEDIUM ACCESS LAYER -** Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window, Slip, Data link Layer in HDC. Pure and slotted Aloha, CSMA, CSMA/CD, collision free multiple access. Throughput analysis of pure and slotted Aloha, IEEE 802.X Standard Ethernet.

**MODULE 3: NETWORK LAYER -** Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. Dynamic routing – Broadcast routing. Network layer in the Internet: IPv4 & IPv6 Protocols. Congestion Control Algorithms – General Principles – of Congestion prevension policies.

**MODULE 4: DATA TRANSMISSION** - Terminology, Frequency, spectrum, bandwidth, analog and digitaltransmission, Transmission impairments, channel capacity including sampling theorem and Fourier series

**Wireless Transmission**: Antenna and antenna gain, introduction to terrestrial and satellite microwave, Propagation of wireless signals, free space loss for LOS communication.Review of Line Encoding Schemes. Concept of bit period, effect of clock skew, Synchronous and Asynchronous communication

**MODULE 5: MULTIPLEXING -** Frequency division, time division (Synchronous and statistical) multiplexing. **Multiple Accesses**: Performance of FDMA-FM-FDMA, Single channel per carrier. TDMA frame structure TDMA Frame efficiency, TDMA superframe structure, Frame acquisition and synchronization **Switching**: Qualitative description of Space division, time division and space-time-space division switching.

**Text/Reference Books:**

1. Computer Network, Leon And Garcia, TMH
2. Data Communication And Networking(Sie), Forouzan, TMH
3. Computer Network, Tanenbaum, Pearson
4. Computer Networking, Kurose, Pearson
5. Computer Networking And Inernet, Halsell, Pearson
6. Digital Telephony, 3rd Ed, James Irvine & David Harle, Wiley

**Semester VI** **B.Tech in Electronics & Communication Engineering**

**BEC 608 INFORMATION THEORY & CODING**

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: ELEMENTS OF INFORMATION THEORY** - Measure of information, average information, entropy, information rate. Communication channel, discrete and continuous channel

**MODULE 2: SHANNON-HARTLEY THEOREM AND ITS IMPLICATIONS**. Channel capacity, Gaussian channel and bandwidth-S/N tradeoff.

**MODULE 3: INTRODUCTION OF CODING** - types of efforts, types of codes, error control coding, methods of controlling errors

**MODULE 4: LINEAR BLOCK AND BINARY CYCLIC CODES** - matrix decryption of linear block codes, error detection and error correction capabilities of linear block codes. Hamming codes, structure of cyclic codes, encoding using an (n-k) bit shift register syndrome calculation, its error detection & correction, special classes of cyclic codes BCH.

**MODULE 5: BURST AND CONVOLUTION CODES -** burst and random error correcting codes, encoders for convolution codes. Decoders for convolution codes

**Text/Reference Books:**

1. Coding and Information Theory (Graduate Texts in Mathematics) by Steven Roman
2. Information and Coding Theory (Springer Undergraduate Mathematics Series) by Gareth A. Jones and J. Mary Jones
3. Information Theory and Network Coding (Information Technology: Transmission, Processing and Storage) by Raymond W. Yeung
4. Fundamentals of Information Theory and Coding Design (Discrete Mathematics and Its Applications) by Roberto Togneri and Christopher J.S deSilva
5. Anoop Singh Poonia, "Information Theory of Coding", Dhanpat Rai Publishing Company.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 609 MICROWAVE ENGINEERING LAB

**0L-0T-2P-1C** **M.M. 100**

1. Study of various microwave components and instruments like frequency meter, attenuator, detector & VSWR meter.
2. Draw V-I characteristics of microwave source like Gunn diode/ Reflex Klystron.
3. Measurement of frequency and wavelength in a rectangular waveguide.
4. Measurement of VSWR (small as well as large values) & reflection coefficient.
5. Measure an unknown impedance with smith chart.
6. Draw the following characteristics of Gunn Diode

(i) Output power and frequency as a function of voltage

(ii) Square wave modulation by PIN diode.

7. Drawing polar pattern of Horn antenna.
8. To observe the action of directional coupler and its use in separating incident & reflected wave.
9. Study of Magic Tee, Circulator, isolator
10. Study of spectrum analyzer & its use in observing the response of

(i) High frequency amplifier

(ii) Low pass, high pass, band pass, band reject filters.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 610 DIGITAL COMMUNICATION LAB

**0L-0T-2P-1C** **M.M. 100**

1. (a) To observe sampling of analog signal. Identify & solve the aliasing problem.

(b) To observe the Transmission of two signals over a single channel using sampling methods.

2. TDM-PAM: Modulation & demodulation.

3. Operation of a PCM encoder & decoder.

4 TDM-PCM: Modulation & demodulation.

5. Observe the performance of a Delta modulation system & to derive from it a delta sigma modulation

system.

6. To generate and study the various data formatting schemes (Unipolar, Bi-polar, Manchester,AMI etc.).

7. Generate ASK signals, with and without carrier suppression. Demodulation of these two types of modulated signal.

8. Generate the FSK wave forms & demodulate the FSK signals based on the properties of (a) Tuned circuits (b) PLL

9. Generate the PSK signals and demodulate it.

**SIMULATION USING ANY VIRTUAL INSTRUMENTATION SOFTWARE:**

10. To carry out convolution in both continuous time and discrete time systems.

11. Companding and multiplexing of PCM signals.

12. Perform various keying Techniques: PSK, ASK, FSK & MSK.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 611 SIGNAL PROCESSING LAB WITH MAT LAB-II

**0L-0T-2P-1C** **M.M. 100**

### MODELING AND SIMULATION USING MAT LAB

1. Realizing a given block diagram having multiplier, adder/subtractor and system (Discrete/Continuous) with given Impulse response. Calculating output for given input.
2. To simulate the transmitter and receiver for BPSK
3. To design and simulate FIR digital filter (LP/HP).
4. To design and simulate IIR digital filter (LP/HP).

### DSP LAB USING TMS320C6XXX DSP KITS

5. To study the architecture of TMS320C6XXX DSP kits using Bloom with DSP.
6. To generate wave form (SINE, COSINE, SQUARE & TRIANGULAR).
7. Verification of Sampling Theorem.
8. Verification of linear/circular convolution.
9. To design FIR & IIR digital filter (LP/HP).

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 612 VLSI AND VHDL LAB

**0L-0T-2P-1C** **M.M. 100**

**PART-I**

Schematic design and make Device Level Layout of following circuits.

1. BJT/FET Amplifier in various configuration..
2. Counters, Shift Registers & Sequence Decoders.
3. Various circuits with Op-Amp.

**PART-II**

Design of following ckt using appropriate software like VHDL/ FPGA.

4. Design all gates using VHDL.
5. Write VHDL programs for the following circuits, check the wave forms and the hardware generated: a. half adder b. full adder
6. Write VHDL programs for the following circuits, check the wave forms and the hardware generated: a. multiplexer b. demultiplexer
7. Write VHDL programs for the following circuits, check the wave forms and the hardware generated: a. decoder b. encoder
8. Write a VHDL program for a comparator and check the wave forms and the hardware generated
9. Write a VHDL program for a code converter and check the wave forms and the hardware generated
10. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated
11. One mini project of VHDL & VLSI Design.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 613 MEMS & MICROSYSTEMS LAB ON COMSOL

**0L-0T-2P-1C** **M.M. 100**

1. Perform simulation of fabrication processes and the microelectronics device short channel MOSFET using TCAD tools.
2. Perform simulation of fabrication processes and the microelectronics device solar photo voltaic device using TCAD tools
3. Perform simulation of fabrication processes and the microelectronics device BJT using TCAD tools
4. Perform simulation of fabrication processes and the microelectronics device PN Diode using TCAD tools
5. Familiarization of Micro fabrication environment in clean room
6. Familiarization of different unit processes.
7. Fabrication of MOS Capacitor
8. Electrical characterization: High frequency capacitance-voltage measurement (HFCV) of MOS devices
9. Electrical characterization: Low frequency capacitance-voltage measurement (LFCV) of MOS devices
10. Electrical characterization: I-V and reliability measurements of MOS devices

**Semester VI** **B.Tech in Electronics & Communication Engineering**

**BEC 614 CAMPUS RECRUITMENT TRAINING – I (TECHNICAL)**

**M.M. 100**

**0L-0T-2P-1C**

As a part of the curriculum, the Campus Recruitment Training (Technical) forms an important component of education for engineering student. It is an attempt to bridge the gap between conventional study and competitive exam study or campus placement. The Program, which would be a help in government jobs as well as top private companies. In the process, it provides training for the students to improve their technical skill as per requirement. This program benefits the student to understand what he/she has studied in the class room and what is being practiced in competitive exam for government and private jobs.

In this program technical preparation according to competitive exam being done in the field of Electronics & Communication.

Major technical subjects **Electronics Circuit & Devices, Communication System,** Microwave System, Antenna Design, Radar System, Digital Signal Processing, Information Theory & Coding, Digital Electronics,

Electronic Measurements**:** measurement of resistance, Inductance and Capacitance, Potentiometer, DC and AC bridges, Moving coil, Moving Iron, Dynamometer, Induction type meter, measurement of Power, Energy and Frequency, Transducers are covered in stage.
The program mainly focuses on multiple choice question which help students for their preparation.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## MGT 204 INTERMEDIATE PROGRAM IN ENTREPRENEURSIP

**0L-0T-2P-1C** **M.M. 100**

**Objective:** This program will teach the students about market size, costs , channels and customer acquisition , business model and plan finalization , efficiency and growth processes.

**Module I:** Identify the vertical for operating your business opportunity, understanding your customers and accurately assessing market opportunity, Minimum Viable Product and The Lean Method.

**Module II:** Developing and validating a business model for your venture – Value Proposition, Customer Segments, Channels and Partners, Revenue Model and Streams, Key Resources, Activities and Costs, Customer Relationships and Customer Development Processes.

**Module III:** Translate your business model into a business plan, Visioning for your venture, Taking your product/service to the market, Delivering an Investor pitch to a panel of investors.

**Module IV**: Identify possible sources of funding for your venture, Marketing your business – Get to Market Plan, effective ways of marketing for start-up – digital and viral marketing, hire and manage a team, Managing start up finance.

**Module V**: Legal and regulatory aspects for starting up your venture , Enhancing the growth process and creating scalability , thorough understanding of market size, costs, margins , delivery channels, customer acquisition costs, Key areas of BM Canvas, 1-2 year roadmap and trajectory.

**References:**

Online courses through MOOC.

1. Tendon ,C: Environment and Entrepreneur; Cliugh Publications, Allahabad.
2. Siner A David: Entrepreneural Megabuks; John Wiley and Sons, New York.
3. Srivastava S. B: A Practical Guide to Industrial Entrepreneurs; Sultan Chand and Sons, New Delhi.
4. Prasanna Chandra: Protect Preparation, Appraisal, Implementation; Tata McGraw Hill. New Delhi.
5. Paudey I.M: Venture Capital - The Indian Experience; Prentice Hall of India. New Delhi
6. Holt: Entrepreneurship-New Venture Creation; Prentice Hall of India. New Delhi
7. World Bank Development report 2015-16.
8. World Bank "doing Business" 2014, 2015, 2016.
9. Govt. of India "Economic survey 2015-16", Oxford University Press
10. UNDP-Human Development Report 2015-16.

**Semester VI** **B.Tech in Electronics & Communication Engineering**

## BEC 615 INDUSTRIAL AUTOMATION SYSTEMS

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: NATURE OF INDUSTRIAL PROCESS:** continuous & discrete state sequential process, process variables and their classification.
**Introduction to Process Control Philosophies:** type of relays, ladder logic methodology, ladder symbols.

**MODULE 2: INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLERS:** advantages & disadvantages of PLC with respect to relay logic, PLC architecture, Input Output modules, PLC interfacing with plant, memory structure of PLC.

**MODULE 3: PLC ARITHMETIC AND LOGICAL FUNCTIONS:** addition, subtraction, multiplication, division instructions, increment decrement, trigonometric and log functions, AND, OR, XOR, NOT functions, PLC compare and convert functions.

**MODULE 4: PLC PROGRAMMING METHODOLOGIES:** ladder diagram, STL, functional block diagram, creating ladder diagram from process control descriptions, introduction to IEC61131 international standard for PLC

**MODULE 5: PLC FUNCTIONS:** bit logic instructions, ladder diagram examples, interlocking, latching, inter dependency and logical functions, PLC Timer & Counter functions on-delay timer, off-delay timers, retentive on-delay timers, pulse timers, timer examples, up-counter, down-counter and up- down counter, counter examples, register basics.
**PLC Data Handling:** data move instructions, table and register moves, PLC FIFO & LIFO functions**.**

**Text/Reference Books:**

1. John Webb, Programmable Logic Controllers Principles & applications, PHI
2. T. A. Hughes, Programmable Controllers
3. C. D. Johnson, Process Control Instrumentation
4. Terry Bartlet , “Industrial Control Electronics Devices, Systems”, Delma

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 701 ANTENNA & WAVE PROPAGATION

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: ANTENNA FUNDAMENTALS** - Antenna Basics: Introduction. Basic Antenna Parameters - Patterns, Beam Area, Radiation Intensity. Beam Efficiency, Definitions: Radiation intensity. Directive gain. Directivity. Power gain, Beam Width. Bandwidth. Directivity-Gain-Resolution, Antenna Apertures. Fields from Oscillating Dipole. Antenna Temperature. Front - to-back Ratio. Radiation- Basic Maxwell's Equations and radiation resistance of current element. Half-wave dipole and folded dipole. Reciprocity principle, Effective length and Effective area. Effective Height Relation between gain effective length and radiation resistance.

**MODULE 2: ANTENNA ARRAYS -** Uniform linear array. Types of Arrays: broadside array, end fire array, collinear array, parasitic array, Method of pattern multiplication, Binomial array. Point Sources - Definition. Patterns, arrays of 2 Isotropic Sources - Different Cases, Expression for electric field from two and three element arrays.

**MODULE 3: VHF, UHF AND MICROWAVE ANTENNAS & MEASUREMENTS -** Hertz and Marconi antennas, folded dipole, yagi-uda antenna, helical antenna, Horn antenna, Frequency independent antennas: log periodic antenna, Microstrip antenna, Loop antenna, parabolic reflector, lens antenna, V and rhombic antenna, Biconical antenna, slot antenna, Spiral antenna.

**Antenna Measurements:** Radiation Pattern measurement, Gain and Directivity Measurements, impedance measurement, polarization measurement and phase measurement.

**MODULE 4: STRUCTURE OF IONOSPHERE AND DIFFERENT LAYERS -** Different ionosphere layers, characteristics and its effects on wave propagation, refraction and reflection of sky waves by ionosphere layers, Ray path, critical frequency, MUF, Virtual Height, skip zone, skip distance, Relation between MUF and skip distance, multiple hope transmission, Energy loss in ionosphere, and summary of wave characteristics in different frequency ranges.

**MODULE 5: RADIO WAVE PROPAGATION -** Different modes of propagation, Ray/mode concepts, Ground Wave Propagation (Qualitative Treatment) - Introduction. Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation -Introduction, Field Strength Variation with Distance and Height. Sky wave propagation, Effect of Earth's Curvature, Absorption. Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena. Troposphere Propagation, Fading and Path Loss Calculations.

**Text/Reference Books:**

1. Antennas, John Kraus, Ronald Marhefka, TMH
2. Electromagnetic Waves And Radiating Systems, E.C. Jordan And K.G. Balmain, PHI
3. Antenna Theory: Analysis And Design, Constantine A. Balanis , John Wiley & Sons
4. Antenna Theory & Design, Robert S. Elliott, John Wiley & Sons
5. Antennas And Wave Propagation, G. S. N. Raju , Pearson
6. Antennas And Wave Propagation, A.R. Harish, M. Sachidananda, Oxford

## BEC 702 RADAR ENGINEERING & SATELLITE COMMUNICATION

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: RADAR BASICS -** Radar Equation, Radar Block Diagram and Operation, Prediction of Range, Minimum Detectable Signal, Receiver Noise, Probability Density Functions, S/N, Integration of Radar Pulses, Radar Cross-section, Transmitter Power, PRF and Range Ambiguities, Radar Antenna Parameters, System Losses and Propagation Effects.

**MODULE 2: TYPES OF RADAR & TRACKING -** MTI and Pulse Doppler Radar: Introduction, Delay line Cancellers, Moving target Indicator, Limitation to MTI performance, MTI from moving platform, Pulse Doppler Radar, Tracking Radar, Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low angle tracking, Pulse compression,Block Diagrams of Synthetic Aperture Radar (SAR), Phased array Radars,. MST Radar, ECM, ECCM, Radar Displays.

**MODULE 3: NAVIGATIONAL AIDS -** Principles of Direction Finders,Radio Altimeter, LORAN, DECCA, OMEGA, Inland Shipping Aids. DME and TACAN - Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment Aids to Approach and Landing - Instrument Landing System - Ground Controlled Approach System - Microwave Landing System(MLS)

**MODULE 4: INTRODUCTION SATELLITE COMMUNICATION -** Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & econospheric effects on link design, complete link design, interference effects on complete link design, earth station parameters.

**MODULE 5: SATELLITE COMMUNICATION AND APPLICATIONS -** Baseband analog (voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques. Multiple Access Techniques TDMA frame structure, burst structure, frame efficiency, superframe, frame acquisition & synchronization, TDMA vs FDMA, burst time plan,beam hopping, satellite switched, Erlang call congestion formula, demand assignment, ctrl, DA-FDMA system, DATDMA. Applications of Satellite Communication in brief.

**Text/Reference Books:**

1. Introduction to Radar Systems, Skolnik, McGraw Hill, 2007.
2. Merrill I. Skolnik ," Introduction to Radar Systems", Tata McGraw-Hill (3rd Edition) 2003
3. Satellite Communication, D. C. Agarwal, Khanna Publishers.
4. Satellite Communication, T. Pratt and S. W. Bostian, John Wiley and Sons.
5. Microwave and Radar Engineering, M.L.Sisodia, Vijay lakxmi Gupta, J.P.Agrawal, New Age Publication.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 703 WIRELESS COMMUNICATION

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION–W**ireless communication standard(1G,2G,2.5G,3G,4G), Fundamentals of fading, Multipath channels, Free space loss, Fresnel zone clearance bending of radio beam, Effective earth radius, Building blocks of Transmitter & Receiver.

**MODULE 2: MULTIPLE ACCESS TECHNIQUES** – FDMA, TDMA and CDMA with reference to mobile radio and satellite systems. TDMA based networks. CDMA based networks

**MODULE 3: MOBILE COMMUNICATION CONCEPT** – Cell fundamental, frequency reuse concept, Concept of cluster, Co channel and adjacent channel concept, cell splitting, sectoring, microcell zone concept, Fixed channel assignment, Dynamic channel assignment.

**MODULE 4: CELLULAR WIRELESS NETWORKS-GSM –** Introduction, overview of the GSM systems, GSM codec, channel coding and interleaving, radio like control, CDMA Digital cellular standard- CDMA forward channel, Reverse CDMA Channel.

**MODULE 5: INTRODUCTION TO NETWORK IN WIRELESS MOBILE COMMUNICATION - T**raffic routing-Circuit switching, packet switching, cordless system and WLL, Mobile IP, Wireless access protocol, . Wireless LAN's: Technology.
IEEE 802.11 standards and Blue tooth. Broadband Wireless 802.16 ,Wireless data service-ISDN,CDPD

**Text/Reference Books:**


1. Mobile Cellular Telecommunications, W.C.Y. Lee, TMH
2. Wireless Communication And Networking, Misra, TMH
3. Fundamentals Of Satellite Communications, K.N. Raja Rao, PHI
4. Wireless Broadband Networks, David T. Wong, Peng-Yong Kong, John Wiley & Sons
5. Satellite Communications, Timothy Pratt, Charles Bostian And, John Wiley & Sons
6. Wireless Communications, Theodore S. Rappaport, Pearson
7. Wireless Communication And Networking, William Stallings, Pearson
8. Wireless Communication, Upena Dalal, Oxford
9. Broadband Wireless Communications, Jiangzhou Wang, Springer
10. Wireless And Mobile Communication, Kumar, Sanjeev, New Age International

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 704 OPTICAL COMMUNICATION

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: OPTICAL FIBERS** - Basic optical laws and definitions, Principles of light propagation in fibers, Ray theory, Optical fiber modes and configurations, Step index and graded index fibers, Monomode and multimode fibers, Fiber materials, fiber fabrication, Fiber optic cables. Attenuation, signal distortion in optical fibers, Dispersionintra modal & inter modal, Dispersion shifted and flattened fiber.

**MODULE 2: OPTICAL SOURCES - LED's** - Structure, Materials, Characteristics, Modulation, Power & efficiency, Laser Diodes - Basic concept, Hetro Structure, properties and modulation.

**MODULE 3: OPTICAL DETECTORS** - PIN and Avalanche photo diodes, photo detector noise, detector response time, Avalanche multiplication noise. Photo diode materials. Fundamental of Optical Receiver Operation.

**MODULE 4: OPTICAL FIBER COMMUNICATION SYSTEMS** - Source to fiber coupling, fiber to fiber joints, fiber splicing, fiber connectors. Principal components. Link design calculation, Applications, Wavelength division multiplexing.

**MODULE 5: OPTICAL FIBER MEASUREMENTS -** Measurements of Fiber attenuation, Dispersion, refractive index profile, Numerical aperture & diameter.

**Text/Reference Books:**


1. Optical Fiber Communication: Principles And Practice,: John M Senior, Pearson
2. Optical Fiber Communications, Keiser, Gerd, TMH
3. Optical Fibre And Laser: Principles And Applications, De, Anuradha, New Age
4. Opto Electronics And Fibre Optics Communication, Sarkar, D.C,
5. Optical Fiber Communications: Principles And Practice, G P Agrawal, Govind P Agrawal, Wiley
6. Optical Fiber Communications: Principles And Practice, John Senior, PHI
7. Fiber Optics Communications, Joseph C Palais, PHI
8. Fiber Optics Communications, Harold Kolimbiris, PHI
9. Understanding Fiber Optics, Jeff Hecht, PHI
10. Optical Communication System, Johan Gowar, PHI
11. Fiber Optics And Optoelectronics, Khare, Oxford
12. Introduction To Optical Fiber Communications Systems, William B. Jones, Oxford
13. Optical Wdm Networks - Principles And Practice, Biswanath Mukherjee, Oxford
14. Fiber Optics Communication(With Cd), Kolimbiris, Pearson
15. Optical Communication, Palais, Pearson

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 705 BIOMEDICAL ENGINEERING

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: HUMAN BODY SUBSYSTEMS –** Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.
TRANSDUCERS AND ELECTRODES: Principles and classification of transducers for Bio-medical applications, Electrode theory, different types of electrodes, Selection criteria for transducers and electrodes.

**MODULE 2: BIOPOTENTIALS –** Electrical activity of excitable cells, ENG, EMG, ECG, ERG, EEG. Neuron potential.
CARDIOVASCULAR SYSTEM MEASUREMENTS: Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, Plethysmograph, Echocardiograph.

**MODULE 3: INSTRUMENTATION FOR CLINICAL LABORATORY –** Measurement of pH valve of blood, ESR measurement, hemoglobin measurement, O2 and CO2concentration in blood, GSR measurement.Instrumentation for clinical laboratory: Spectrophotometry, chromatography, Hematology, Measurement of pH value, concentration in blood. MEDICAL IMAGING: Diagnostic X-rays, CAT, MRI, thermography, Ultrasonography, medical use of isotopes, endoscopy.

**MODULE 4: PATIENT CARE, MONITORING AND SAFETY MEASURES -** Elements of Intensive care monitoring basic hospital systems and components, physiological effect of electric current shock hazards from electrical equipment, safety measures, Standards & practices.
COMPUTER APPLICATIONS AND BIOTELEMETRY: Real time computer applications, data acquisition and processing, remote data recording and management.

**MODULE 5: THERAPEUTIC AND PROSTHETIC DEVICES -** Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy, heart lung machine, Hemodialysis, Applications of Laser.

**Text/Reference Books:**

1. Medical Instrumentation: Application And Design, 3ed-, Webster, Wiley
2. Biomedical Signal Processing, D Reddy, TMH
3. Electronics In Medicine And Biomedical Instrumentation, PHI

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 706 FILTER DESIGN

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: REVIEW OF OP-AMPS CIRCUITS -** Categorization of filters-Low-pass filter, High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and Delay equalizers.

**MODULE 2: APPROXIMATION THEORY -** Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation, Basic of sensitivity, Frequency Transformations.

**MODULE 3: THREE AMPLIFIER BIQUAD -** Basic low pass and band pass circuit, realization of the general Biquadratic Functions, summing of four Amplifier biquad, feed forward three amplifier biquad, Passive Ladder
structures, Inductor Substitution using Gyrator, Transformation of elements using the FDNR. Active ladder filters. Active R filters.

**MODULE 4:** ELEMENTARY transconductor building blocks, resistors, integrators, amplifiers, summers, gyrator, First and second order filters, higher order filters.

**MODULE 5: SWITCHED CAPACITOR FILTERS:** The MOS switch, The switched capacitor, first order building blocks, second order sections, sampled data operation, Switched capacitor first and second order filters, Bilinear transformation based SC filter design.

**Text/Reference Books:**

1. Gobind Daryanani, "Principles of active network synthesis and design",John Wiley & Sons.
2. R. Schaumann, M. E. Van Valkenburg, "Design of analog filters", Oxford University Press.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 707 INTEGRATED CIRCUIT TECHNOLOGY

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION TO IC TECHNOLOGY -** SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations.
Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.

**MODULE 2: OXIDATION -** Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties.
Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition:
Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.

**MODULE 3: DIFFUSION -** Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.

**MODULE 4: METALLIZATION -** Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.

**MODULE 5: VLSI PROCESS INTEGRATION -** Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication

**Text/Reference Books:**

1. S. M. Sze, “VLSI Technology”, 2nd Edition, McGraw –Hill Publication. Reference Books:
2. S.K. Ghandhi, “VLSI Fabrication Principles”, 2nd Edition,. Willy-India Pvt. Ltd.
3. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, practice and modelling”, Pearson Education.
4. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, Oxford Univ Press.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 716 ROBOTICS & FLEXIBLE AUTOMATION

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: ROBOT COORDINATE SYSTEM-** Position and orientation of objects, Object coordinate frames, Rotations matrix, Euler angles , Roll pitch and yaw angles coordinate, Transformations, Joint variables and position of end effecter, Dot and Cross products, coordinates frames, Rotations, Homogeneous coordinates

**MODULE 2: FORWARD KINEMATIC -**Introduction to Forward kinematic, Denavit-Hartenberg (D-H) representation (with examples), The arm equation, the arm matrix of serial link manipulators, forward/direct kinematic analysis for serial link manipulators.

**MODULE 3: INVERSE KINEMATIC -** Introduction to inverse kinematics, General properties of inverse kinematic solution, Tool configuration vector, Tool configuration of serial link manipulators with examples of five axis. Articulated robot and four-axis SCARA Robot. Inverse kinematics of a serial link manipulator

**MODULE 4: VELOCITY AND STATIC ANALYSIS OF ROBOTIC MANIPULATORS-** Linear and angular velocity of links, Velocity propagation, Manipulator Jacobians for serial and parallel manipulators, Velocity ellipse and ellipsoids, Singularity analysis for serial and parallel manipulators, Loss and gain of degree of freedom, Statics of serial manipulators, work space analysis of serial link manipulators

**Dynamics of serial manipulators-** Mass and inertial of links, Lagrangian formulation for equations of motion for serial manipulators, Kinetic and potential energy, Lagrangian-Euller dynamic mode., Direct and inverse dynamics, Recursive dynamics using Newton-Euler formulation

**MODULE 5: MOTION PLANNING AND CONTROL-**Joint and Cartesian space trajectory planning and generation, Classical control concepts using the example of control of a single link, Independent joint PID control, Control of a multi-link manipulator, Non linear model based control schemes.

**Robot programming-** On line programming, teach pendant control, Lead through programming, Walk through programming, off line programming, Task programming.

**Text/Reference Books:**


1. Schilling, R. J., Fundamentals of Robotics Analysis & Control, Prentice Hall of India
2. Fu, K. S., Gonzalez, R. C. and Lee, C. S., Robotics: Control, Sensing, Vision, and Intelligence, McGraw Hill
3. Craig, J. J., Introduction to Robotics: Mechanics and Control, Pearson Education
4. Deb, S. R., Robotics and Flexible Automation. McGraw Hill.
5. Saha, S. K., Introduction to Robotics, McGraw Hill

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 708 IMAGE PROCESSING

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION** – Fundamental steps in DIP, elements of DIP, Simple image model, sampling & quantization, basic relationships between pixels, colour image model.

**MODULE 2: IMAGE TRANSFORMS –** One-dimensional & two-dimensional DFT, cosine, sine, Hadamard, Haar, and Slant & modelling, spatial operations, Transform operations.

**MODULE 3: IMAGE RESTORATION** KL transforms. Image Enhancement: Introduction, point operations, histogram
**–** Introduction, image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.

**MODULE 4: IMAGE COMPRESSION –** Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding

**MODULE 5: IMAGE SEGMENTATION –** Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.

**Text/Reference Books:**


1. Digital Image Processing Using MATLAB, Gonzalez, Woods and Eddins, Gatesmark Publishing
2. Applications of Pattern Recognition, Fu, K.S., CRC Press
3. Digital Image Restoration, Andrews, H.C. Hunt, B.R., Prentice Hall, Englewood Cliffs.
4. Applications of Digital Signal Processing, Oppenheim, A.V.,Prentice Hall Englewood Cliffs.
5. Digital Image Processing, Gonzalez, R.C. & Wintz, P.A., Reading, Addison-Wesley.
6. Digital Image Processing, Pratt, W.K., New York: Wiley
7. Digital Image Processing of Remotely Sensed Data, Hord, R.M., Academic Press.
8. Pattern Recognition: Human and Mechanical, Watanabe, S., Wiley
9. Fundamentals of Digital Image Processing, Jain, A.K., Prentice Hall
10. Algorithms for Graphics and Image Processing, Pavlidis, T., Computer Sc.Press
11. Selected Papers on Digital Image Processing, Trivedi, M.M., Optical Engg Press.
12. The Image Processing Handbook, Ross, J.C., CRC Press, Boca Raton
13. Fundamentals of Digital Image Processing, Anil K Jain, PHI.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 709 ARTIFICIAL NEURAL NETWORK

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION -** Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks. Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation.

**MODULE 2: ARTIFICIAL NEURONS**, Neural networks and architectures Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture. Geometry of Binary threshold neurons and their networks, Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution.

**MODULE 3: PERCEPTRONS AND LMS LEARNING OBJECTIVE OF TLN -** pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α– LMS learning, MSE error surface, steepest descentsearch, μ– LMS and application. Back propagation and other learning algorithms Multilayered architecture, back propagation learning algorithm, practical considerations, structure growing algorithms, applications of feed forward neural networks, reinforcement learning

**MODULE 4: STATISTICAL PATTERN RECOGNITION:** Bayes' theorem, classical decisions with Bayes' theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems. RBF Networks Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons. Stochastic Machines Statistical mechanics, simulated annealing, Boltzmann machine.

**MODULE 5: ADAPTIVE RESONANCE** Theory Building blocks of adaptive resonance, Adaptive Resonance Theory 1.Self Organizing Feature MAP Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, Mexican hat networks.

**Text/Reference Books:**

1.Simon Haykin, "Neural Networks", PHI
2.J. M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 3rd Ed.
3.Artificial Neural Networks, Jacek M Zurada, Pws Pub Co
4.Neural Networks: A Classroom Approach, Satish Kumar, TMH
5.Artificial Neural Networks, Christina Ray, TMH
6.Neural Networks For Pattern Reconization, Bishop, Oxford
7.Neural Network In Soft Computing Framework, Swamy, Springer

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 710 DIGITAL SYSTEM DESIGN USING VHDL

**3L-0T-0P-3C** **M.M. 100**

**MODULE 1: INTRODUCTION:** Digital system design Methodology, Advantages, Requirement Analysis and specification, HDL V/S programming languages, Emergence of HDL, Fundamental & history of various hardware description language, VHDL description, Verification Using simulations, Functional Simulation, Logic Synthesis, Place and route and timing Simulation VHDL for Synthesis V/s Simulation, Design flow of ASICs and standard logic circuits.

**MODULE 2: LANGUAGE FUNDAMENTALS:** Basic constructs of VHDL programs- Entity declaration, architecture declaration, configuration declarations, package body, package declarations, Entities, Architectures and coding Styles, Comparison of different VHDL coding styles, Identifiers, Signals and Data types, Operators, Overloading, Types of delays, Dataflow, Structural, Behavioral and RTL Style of Combinational design,Signals verses Variables

**MODULE 3: VHDL STATEMENTS:-** Process statements, Block Statements,Assignments statements, Component declarations, Component instantiation ststements, generate statements, IF statements, case statements, Loop ststements, next statements, Exit statements, return statements, Null statements, wait statements, Assertion statements, concurrent v/s sequential statements, Library& Packages, subprogram-Function and procedure, test benches, generics.

**MODULE 4: COMBINATIONAL and SEQUENCIAL CIRCUITS BUILDING BLOCKS:** VHDL modeling of combinational circuits-Half adder, full adder, half subtractor, full subtractor, Multiplexer, demultiplexer, encoder, decoder, Code Converters, comparators, implementation of Boolean equations using VHDL, VHDL modeling for sequential circuits-Flip-Flops, shift registers, Counters,VHDL modeling for synchronous and asynchronous sequential circuits.

**MODULE 5: DIGITAL SYSTEM DESIGN:** Building Block circuits, Memory organization, SRAM, Design examples of Multiplier, Shifting & Sorting Operations, Clock Synchronization, CPU organization and design concepts.

**Text/Reference Books:**

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 717 ROBOTICS LAB

**0L-0T-3P-3C** **M.M. 100**

**List of Experiments**

1. Study of different actuators and end effectors for robot.
2. Robot Programming with Computer Simulation Softwares.
3. Programming of robots by manual, lead through and off-line methods, use of robot programming languages to pick and place, stacking of objects in increasing or decreasing size, palletizing operations, assembly and inspection operation etc.
4. Solving Robot Arm Kinematics with Matlab Matrix multiplication
5. Solving Robot Arm Kinematics with Matlab Concatenation of matrices in matlab.
6. Solving Robot Arm Kinematics with Matlab inverse of a matrix.
7. To solve different transformation matrices to find the homogeneous transformation matrix of robotic manipulator.
8. To find the joint angles when the end effector position is given.
9. Robot workspace: Plot of end effector position vector in three dimensional space.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 711 ADVANCE COMMUNICATION LAB

**0L-0T-2P-1C** **M.M. 100**

**PART-I: Communication Systems -**

1. Radar Trainer: Working of Doppler radar, velocity of moving object, time and frequency measurement and other applications.

2. To perform Modulation, Demodulation and BER measurement using CDMA – DSSS Trainer.

3. To establish analog/digital communication link and transmit & receive three signals (audio, video, tone) simultaneously using Satellite Communication Trainer.

4. To study GPS Receiver, establishing link between GPS satellite & GPS trainer and measure of latitude & longitude

**PART-II: Optical Communication -**

To perform following experiments based on Fiber Optic Trainer.

5. To set up Fiber Optic Analog link.

6. To set up fiber Optic Digital link.

7. Measurement of Propagation loss and numerical aperture.

8. Characterization of laser diode and light emitting diode.

**PART-III: Network & Protocols -**

**9. Case study: on LAN Training kit**

(i) Observe the behavior & measure the throughput of reliable data transfer protocols under various Bit error rates for following DLL layer protocolsa. Stop & Wait

b. Sliding Window : Go-Back-N and Selective Repeat

(ii) Observe the behavior & measure the throughput under various network load conditions for following MAC layer Protocols

a. Aloha

b. CSMA, CSMA/CD & CSMA/CA

c. Token Bus & Token Ring

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 712 ANTENNA & WAVE PROPAGATION LAB

**0L-0T-2P-1C** **M.M. 100**

1. Measurement of antenna characteristics :

Radiation Pattern on polar plots, Beam width and Gain of main lobe for the following types of antennas.

(a) Half wave and quarter wave dipole

(b) Folded dipole

(c) Yagi UDA multiple element folded dipole

(d) Hertz Antenna

(e) End fire array and broad side array

(f) Helix antenna

(g) Paraboloid reflector antenna

(h) Loop antenna

(i) Ground plane antenna

(j) Log periodic antenna

(k) Rhombus antenna

(l) Slot antenna

2. Demonstration of modeling of wire antenna using the appropriate design software.

3. Simulation of antenna arrays using appropriate software.

4. Design and testing of the microstrip rectangular patch antenna using appropriate software.

5. Investigate the transmission characteristics of the link and measure the gain of the microstrip patch antennas. Draw the antenna radiation diagram.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

**BEC 713 PROJECT STAGE -I**

**0L-0T-2P-1C** **M.M. 100**

The object of Project -I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

**Text & Reference Books:**

1. Survey and study of published literature on the assigned topic;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Working out a preliminary Approach to the Problem relating to the assigned topic; Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/ Feasibility;
5. Preparing a Written Report on the Study conducted for presentation to the Department;
6. Final Seminar, as oral Presentation before a Departtmental Committtee.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## MGT 103 PROJECT FORMULATION AND APPRAISAL

**0L-0T-2P-1C** **M.M. 100**

**Module 1:** Introduction – project attributes; project life cycle; role of managers; Management – scheduling; Gantt charts; CPM; PERT; crashing; Generation of project ideas – resource allocation; environment analysis – PEST analysis, porter's model; analysis of strategic capabilities – value chain, BCG matrix, flexibility

**Module 2:** Appraisal methods in project scanning and selection – market appraisal; technical appraisal; environmental appraisal; evaluating intangibles, social appraisal – SCBA, UNIDO, LM, CSR.

**Module 3:** Total quality management: Introduction - Need for quality - Evolution of quality - Definition of quality -Basic concepts of TQM - Definition of TQM – TQM Framework -Contributions of Deming, TQM principles , The seven traditional tools of quality – New management tools – Six-sigma.

**Module 4:** **Financial Appraisal:** Time value of money; cost of capital – equity, debt, preference; weighted average cost; marginal and average cost; Capital budgeting – investment appraisal techniques; NPY; IRR; Payback period; replacement decisions; selection of exact discount factor – problems, inflation, taxation;

**Module 5:** **Risk Analysis** models – single probability analysis; sensitivity analysis; break even analysis; certainty equivalent; uncertainty analysis, simulation; decision tree model; risk and utility.

**Text & Reference Books:**


1. Khatua Sitangshu. *Project Management and Appraisal*, Oxford University Press
2. Pandey, I.M. *Financial Management*. Vikas Publishing House
3. Prasanna, Chandra. *Financial Management*. Tata McGraw-Hill
4. Maheshwari, S .N. & Maheshwari, S. K. *Advanced Management Accounting Vol.1 & Vol.2*. Vikas Publishing House
5. Paresh Shah. *Management Accounting*. Oxford University Press

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 714 SEMINAR

**0L-0T-2P-1C** **M.M. 100**

**OBJECTIVE**

The students are to select one technical topic related its branch for Seminar. The student is to submit the synopsis for assessment and approval. Progress for preparation of the seminar topic would be continuously assessed from time to time. Two periods per week are to be allotted and students are expected to present the seminar Progress. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain the attendance.

Students have to give a final presentation for 15 minutes on his topic. Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BEC 715 CAMPUS RECRUITMENT TRAINING – II (TECHNICAL)

**0L-0T-2P-1C** **M.M. 100**

As a part of the curriculum, the Campus Recruitment Training (Technical) forms an important component of education for Engineering student. It is an attempt to bridge the gap between conventional study and competitive exam study or campus placement. The Program, which would be a help in government jobs as well as top private companies. In the process, it provides training for the students to improve their technical skill as per requirement. This program benefits the student to understand what he/she has studied in the class room and what is being practiced in competitive exam for government and private jobs.

Campus Recruitment Training (Technical) II cover
**Power Electronics:** SCR, IGBT, GTO, TRAIC DIAC, single phase converter, three phase converter, Inverter, Voltage Regulator, cycloconveter, chopper.

**Control System:** Block Diagram, PID controller, input signals and compensating networks. **Power System:** Generation, Transmission, Line parameters, load flow analysis, Faults, Stability, Economical operation and control.

**Microprocessor:** Introductions of 8085, 8086 microprocessor, construction, block diagrams. The program mainly focus on multiple choice question which help students for their preparation.

**Semester VII** **B.Tech in Electronics & Communication Engineering**

## BME 512 BASIC INDUSATRIAL ROBOTICS LAB

**0L-0T-2P-1C** **M.M. 100**

**MODULE 1:**

1. Robot Definition: Definition of robots, Evolution of robots, Laws of robots, International Robotic Standards, Why Robots? Types of robots, Selection of robots.

2. Robot Classifications: degrees of freedom; degrees of movements, robot configuration; accuracy and repeatability, specification of a robot ,actuators and sensors, drives and transmission systems used in robotics. Applications of robots.

**MODULE 2:**

Coordinate Transformation: Direct kinematic problem in robotics, geometry based direct kinematic analysis coordinate & vector transformation using matrices, the orientation matrix & translator vector, homogeneous transformation matrices, three dimensional homogeneous transformations.

**MODULE 3:**

Trajectory interpolation: Introduction, the necessity of interpolators, the generation of motion commands, the trajectory planning, basic structure of interpolators. The solvability of the inverse, kinematics problem. particular solutions for the inverse kinematics problem - two – axis planar mechanisms, example of three-axis spherical mechanism, specific solutions for six-axis manipulators.

**MODULE 4:**

Autonomous mobile robots: Introduction, locomotion - key issues for locomotion, legged mobile robots, leg configurations & stability , examples of legged robot locomotion , wheeled mobile robots, wheeled locomotion-the design space, wheeled locomotion: case studies.

**MODULE 5:**

Mobile robot kinematics: introduction, kinematics models & constraints, representing robot position, forward kinematics models, wheel kinematics constraints, robot kinematics constraints, examples robot kinematics models & constraints. Mobile robot maneuverability- degree of mobility, degree of steerability, robot maneuverability. Mobile robot workspace-degree of freedom, holonomic robots, path & trajectory considerations. Motion control - open loop control, feedback control.

**Text/ Reference Books:**


1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers - Yoram Korean- McGrew Hill Co.
3. Industrial Robotics Technology programming and Applications - M.P.Groover, M.Weiss, R.N.Nagel, N.G.Odrey.
4. Robotics Control Sensing, Vision and Intelligence - K.S.Fu, R.C.Gonzalex, C.S.G.Lee- McGrew hill Book co.
5. Kinematics and Synthesis of linkages - Hartenberg and Denavit - McGrew Hill Book Co

6. Kinematics and Linkage Design - A.S. Hall - Prentice Hall

**Semester VIII** **B.Tech in Electronics & Communication Engineering**

**BEC 801 INTERNSHIP(ONE SEMESTER)**

**0L-0T-0P-16C** **M.M. 100**

**Objective:** To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The practical training aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

The purpose of practical training is not only to get acquainted with the culture of companies, but also to realize something of importance for the company visited. By working in a group within the company, it is expected that the trainee gets a better insight in the practical aspects of the industry. This is intended to facilitate the transition from the thorough theoretical education, dispensed at our University, into an industrial professional career.