BIJU PATNIK UNIVERSITY OF TECHNOLOGY

COMPUTER SCIENCE & ENGINEERING (CSE) & Information Technology (IT)

3rd Semester				4th Semester			
Theory		**Contact Hours**		**Theory**		**Contact Hours**	
Code	**Subject**	**L-T-P**	**Credit**	**Code**	**Subject**	**L-T-P**	**Credit**
BSCM1205	Mathematics-III	3-1-0	4	BSCM1211	Discrete Mathematics	3-0-0	3
BEES2211	Network Theory	3-1-0	4	PCCS4203	System Programming	3-0-0	3
BSCP1207	Physics of Semiconductor Devices	3-0-0	3	PCCS4204	Design and Analysis of Algorithm	3-1-0	4
BECS2207	Object Oriented Programming	3-1-0	4	PCCS4205	Database Engineering	3-1-0	4
PCEC4201	Analog Electronics Circuit	3-1-0	4	PCEC4202	Digital Electronics Circuit	3-1-0	4
HSSM3204	Engineering Economics and Costing	3-0-0	3	HSSM3205	Organizational Behavior	3-0-0	3
	Or				Or		
HSSM3205	Organizational Behavior			HSSM3204	Engineering Economics and Costing		
	Theory Credits		**22**		**Theory Credits**		**21**
	Practical / Sessional				**Practical / Sessional**		
HSSM7203	COMMUNICATION AND INTERPERSONAL SKILLS FOR CORPORATE READINESS LAB	0-0-3	2	PCEC7202	Digital Electronics Circuit Lab	0-0-3	2
PCEC7201	Analog Electronics Lab	0-0-3	2	PCCS7204	Design and Analysis of Algorithm Lab	0-0-3	2
BECS7207	Object Oriented Programming Lab.	0-0-3	2	PCCS7205	Database Engg. Lab	0-0-3	2
	Practical/Sessional Credits		**6**		**Practical/Sessional Credits**		**6**
	TOTAL SEMESTER CREDITS		**28**		**TOTAL SEMESTER CREDITS**		**27**

BSCM1205 **Mathematics - III**

Module-I **(18 hours)**

Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type, Monge's method, Second order partial differential equation. The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.

Module-II **(12 hours)**

Complex Analysis:
Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping,
Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

Module –III **(10 hours)**
Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method, evaluation of real integrals.

Text books:

1. E. Kreyszig," Advanced Engineering Mathematics:, Eighth Edition, Wiley India
   Reading Chapters: 11,12(except 12.10),13,14,15
2. B.V. Ramana, " Higher Engineering Mathematics", McGraw Hill Education, 2008
   Reading chapter: 18

Reference books:

1. E.B. Saff, A.D.Snider, " Fundamental of Complex Analysis", Third Edition, Pearson Education, New Delhi
2. P. V. O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

BEES2211 **Network Theory**

MODULE- I **(14 Hrs)**

1. NETWORK TOPOLOGY: Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis.
2. NETWORK THEOREMS & COUPLED CIRCUITS: Substitution theorem, Reciprocity theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem, Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling, Band Width and Q-factor for series and parallel resonant circuits.

MODULE- II **(13 Hrs)**

3. LAPLACE TRANSFORM & ITS APPLICATION: Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Application of Laplace transform: Circuit Analysis (Steady State and Transient).
4. TWO PORT NETWORK FUNCTIONS & RESPONSES: z, y, ABCD and h-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks, Network Functions, Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behaviour from Pole-Zero plots.

MODULE- III **(13 Hrs)**

5. FOURIER SERIES & ITS APPLICATION: Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions, Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response.
6. NETWORK SYNTHESIS: Hurwitz polynomial, Properties of Hurwitz polynomial, Positive real functions and their properties, Concepts of network synthesis, Realization of simple R-L, R-C and L-C functions in Cauer-I, Cauer-II, Foster-I and Foster-II forms.

Text Book:

1. Network Theory – P K Satpathy, P Kabisatpathy, S P Ghosh and A K Chakraborty – Tata McGraw Hill, New Delhi.

Reference Book(s):

2. Network Analysis – M E Van Valkenburg – Pearson Education.
3. Network Synthesis – M E Van Valkenburg – Pearson Education.
4. Network Analysis and Synthesis – Franklin F. Kuo – Wiley Student Edition.
5. Fundamentals of Electric Circuits – Alexander & Sadiku – Tata McGraw Hill.
6. Linear Circuits Analysis and Synthesis – A Ramakalyan – Oxford University Press.
7. Problems & Solutions in Electric Circuit Analysis – Sivananda & Deepa – Jaico Book.
8. Network Theory, Smarajit Ghosh, PHI.

BSCP 1207 **Physics of Semiconductor Devices**

Module-I (10 Hours)

1. **Introduction to the quantum theory of solids**: Formation of energy bands, The k-space diagram (two and three dimensional representation), conductors, semiconductors and insulators.
2. **Electrons and Holes in semiconductors:** Silicon crystal structure, Donors and acceptors in the band model, electron effective mass, Density of states, Thermal equilibrium, Fermi-Dirac distribution function for electrons and holes, Fermi energy. Equilibrium distribution of electrons & holes: derivation of *n* and *p* from D(E) and f(E), Fermi level and carrier concentrations, The *np* product and the intrinsic carrier concentration. General theory of *n* and *p*, Carrier concentrations at extremely high and low temperatures: complete ionization, partial ionization and freeze-out. Energy-band diagram and Fermi-level, Variation of E_F with doping concentration and temperature.
3. **Motion and Recombination of Electrons and Holes:** Carrier drift: Electron and hole mobilities, Mechanism of carrier scattering, Drift current and conductivity.

Module II (11 Hours)

4. **Motion and Recombination of Electrons and Holes (continued):** Carrier diffusion: diffusion current, Total current density, relation between the energy diagram and potential, electric field. Einstein relationship between diffusion coefficient and mobility. Electron-hole recombination, Thermal generation.
5. **PN Junction:** Building blocks of the pn junction theory: Energy band diagram and depletion layer of a pn junction, Built-in potential; Depletion layer model: Field and potential in the depletion layer, depletion-layer width; Reverse-biased PN junction; Capacitance-voltage characteristics; Junction breakdown: peak electric field. Tunneling breakdown and avalanche breakdown; Carrier injection under forward bias-Quasi-equilibrium boundary condition; current continuity equation; Excess carriers in forward-biased pn junction; PN diode I-V characteristic, Charge storage.
6. **The Bipolar Transistor:** Introduction, Modes of operation, Minority Carrier distribution, Collector current, Base current, current gain, Base width Modulation by collector current, Breakdown mechanism, Equivalent Circuit Models - Ebers -Moll Model.

Module III (12 Hours)

7. **Metal-Semiconductor Junction:** Schottky Diodes: Built-in potential, Energy-band diagram, I-V characteristics, Comparison of the Schottky barrier diode and the pn-junction diode. Ohmic contacts: tunneling barrier, specific contact resistance**.**
8. **MOS Capacitor:** The MOS structure, Energy band diagrams, Flat-band condition and flat-band voltage, Surface accumulation, surface depletion, Threshold condition and threshold voltage, MOS C-V characteristics, Q_{inv} in MOSFET.
9. **MOS Transistor:** Introduction to the MOSFET, Complementary MOS (CMOS) technology, V-I Characteristics, Surface mobilities and high-mobility FETs, JFET, MOSFET V_t, Body effect and steep retrograde doping, pinch-off voltage,

Text Books:

1. Modern Semiconductor Devices for Integrated Circuits, Chenming Calvin Hu, Pearson Education/Prentice Hall, 2009.
2. Semiconductor Physics and Devices, 3rd Edition, Donald A. Neamen, Tata McGraw Hill Publishing Company Limited, New Delhi.

Reference Books:

1. Fundamentals of Semiconductor Devices, M.K. Achuthan and K.N. Bhatt, Tata McGraw Hill Publishing Company Limited, New Delhi.
2. Solid State Electronics Devices, 6th Edition, Ben. G. Stretman and Sanjay Banarjee, Pearson Education, New Delhi.
3. Physics of Semiconductor Devices, 3rd Edition, S.M. Sze and Kwok K. Ng, Wiley India Pvt. Limited, New Delhi.
4. Physics of Semiconductor Devices, 2nd Edition, Dillip K. Roy, University Press (India) Pvt. Ltd., Hyderabad.
5. Solid State Electronics Devices, D.K. Bhattacharya and Rajnish Sharma, Oxford University Press, New Delhi.

PCCS2207 Object Oriented Programming

Module I **(08 hrs)**

Introduction to object oriented programming, user defined types, structures, unions, polymorphism, encapsulation. Getting started with C++ syntax, data-type, variables, strings, functions, default values in functions, recursion, namespaces, operators, flow control, arrays and pointers.

Module II **(16 hrs)**

Abstraction mechanism: Classes, private, public, constructors, destructors, member data, member functions, inline function, friend functions, static members, and references.

Inheritance: Class hierarchy, derived classes, single inheritance, multiple, multilevel, hybrid inheritance, role of virtual base class, constructor and destructor execution, base initialization using derived class constructors.

Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Ambiguity in function overloading, Dynamic polymorphism: Base class pointer, object slicing, late binding, method overriding with virtual functions, pure virtual functions, abstract classes.

Operator Overloading: This pointer, applications of this pointer, Operator function, member and non member operator function, operator overloading, I/O operators.

Exception handling: Try, throw, and catch, exceptions and derived classes, function exception declaration, unexpected exceptions, exception when handling exceptions, resource capture and release.

Module III **(16 hrs)**

Dynamic memory management, new and delete operators, object copying, copy constructor, assignment operator, virtual destructor.
Template: template classes, template functions.
Standard Template Library: Fundamental idea about string, iterators, hashes, iostreams and other types.
Namespaces: user defined namespaces, namespaces provided by library.
Object Oriented Design, design and programming, role of classes.

Text Books:

1. Object Oriented Programming with C++ by E. Balagurusamy, McGraw-Hill Education (India)
2. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education

Reference Books:

1. Big C++ - Wiley India
2. C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
3. C++ and Object Oriented Programming – Jana, PHI Learning.
4. Object Oriented Programming with C++ - Rajiv Sahay, Oxford
5. Mastering C++ - Venugopal, McGraw-Hill Education (India)

PCES4201 **Analog Electronics Circuit**

MODULE – I (12 Hours)

1. **MOS Field-Effect Transistor:** Principle and Physical Operation of FETs and MOSFETs. P-Channel and N-Channel MOSFET, Complimentary MOS, V-I Characteristics of E- MOSFETS and D-MOSFETS, MOSFETS as an Amplifier and a Switch (4 Hours)
2. **Biasing of BJTs:** Load lines (AC and DC), Operating Points, Fixed Bias and Self Bias, DC Bias with Voltage Feedback, Bias Stabilization, Design Operation. (4 Hours)
3. **Biasing of FETs and MOSFETs:** Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design (4 Hours)

MODULE – II (17 Hours)

4. **Small Signal Analysis of BJTs:** Small-Signal Equivalent-Circuit Model, Graphical Determination of h-parameters Small Signal Analysis of CE, CC, CB Amplifier with and without R_E. Effect of R_S and R_L on CE Amplifier, Emitter Follower, Analysis of

Cascade, Darlington Connection and Current Mirror Circuits using BJTs. (6 Hours)

5. **Small Signal Analysis of FETs:** Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifier with and without R_S. Effect of R_{SIG} and R_L on CS Amplifier, Analysis of Source Follower and Cascaded System using FETs. (6 Hours)
6. **High Frequency Response of FETs and BJTs:** Low and High Frequency Response of BJTs and FETs, The Unit gain – frequency (f_t), Frequency Response of CS Amplifier, Frequency Response of CE Amplifier, Multistage Frequency Effects, Miller Effect Capacitance, Square Wave Testing. (5 Hours)

MODULE – III (12 hours)

7. **Feedback and Oscillators:** Feedback Concepts, Four Basic Feedback Topologies, Practical Feedback Circuits, Feedback Amplifier Stability using Nyquist Plot, Basic Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits. (4 Hours)
8. **Operational Amplifier:** Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Slew rate, Non-inverting Configurations, Effect of Finite Open-loop and Closed-loop Gain, Differentiator and Integrator, Instrumentation amplifier, µA 741-Op-Amp . (5 Hours)
9. **Power Amplifier:** Classifications, Class-A and Class-B Amplifier Circuits, Transfer Characteristics, Power Dissipation and Conversion Efficiency of Power Amplifiers. (3 Hours)

Text Books:

1. Electronic Devices and Circuits theory, 9th/10th Edition, R.L. Boylestad and L.Nashelsky (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14), Pearson Education, New Delhi.
2. Microelectronics Circuits, 5th Edition, International Student Edition Sedra and Smith (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14), Oxford University Press, New Delhi.
3. Electronic Devices and Circuits, 3rd Edition, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi. **(*For Problem Solving*)**

Reference Books:

1. Electronics Circuits Analysis and Design, 3rd Edition, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Milliman's Electronics Devices and Circuits, 2nd Edition, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Microelectronic Circuits: Analysis and Design, India Edition, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc.

HSSM3204 **Engineering Economics & Costing**

Module-I: **(12 hours)**

Engineering Economics – Nature and scope, General concepts on micro & macro economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition (Simple numerical problems to be solved). Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: **(12 hours)**

Time value of money – Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

Module-III: **(12 hours)**

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved)
Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

Text Books:

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
2. M.D. Mithani, Principles of Economics.

Reference Books :

1. Sasmita Mishra, “Engineering Economics & Costing “, PHI
2. Sullivan and Wicks, “ Engineering Economy”, Pearson
3. R.Paneer Seelvan, “ Engineering Economics”, PHI
4. Gupta, “ Managerial Economics”, TMH
5. Lal and Srivastav, “ Cost Accounting”, TMH

HSSM 3205 **Organizational Behaviour**

Module I :

The study of Organizational Behaviour : Defination and Meaning, Why Study OB
Learning – Nature of Learning, How Learning occurs, Learning and OB.
Foundations of Individual Behaviour : Personality – Meaning and Defination, Determinants of Personality, Personality Traits, Personality and OB.
Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB. Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

Module II :

Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness, Groups in Organizations – Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. Leadership-Leadership & Management, Theories of Leadership-Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Followership, How to be an effective Leader, Confict-Nature of Conflict and Conflict Resolution. An Introduction to Transactional Analysis (TA).

Module-III :

Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management-Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organisational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

Text Books :

1. Keith Davis, Organisational Behaviour, McGraw-Hill.
2. K.Aswathappa, Organisational Behaviour, Himalaya Publishing House.

Reference Books :

1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India
2. Pradip N. Khandelwal, Organizational Behaviour, McGraw-Hill, New Delhi.
3. Uma Sekaran, "Organizational Behaviour", TATA McGraw-Hill, New Delhi.
4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma" Organizational Behaviour" , TATA McGraw- Hill.
5. D.K. Bhattachayya, "Organizational Behaviour", Oxford University Press
6. K.B.L.Srivastava & A.K.Samantaray, "Organizational Behaviour" India Tech

HSSM7203 Communication & Interpersonal skills for Corporate Readiness Lab.

Lab **30 hours**

This course will focus on communication in professional (work-related) situations of the kind that BPUT graduates may expect to encounter on entering the professional domain.

Some typical forms of work-related communication, oral or written, are listed below. Practice activities for all four skills can be designed around these or similar situations.

1. Gaining entry into an organization
   i. Preparing job-applications and CVs
   ii. Facing an interview
   iii. Participating in group discussion (as part of the recruitment process)

2 In-house communication

a. Superior/ Senior ➔ subordinate / junior (individual ➔ individual / group)
   i. Welcoming new entrants to the organization, introducing the workplace culture etc
   ii. Briefing subordinates / juniors : explaining duties and responsibilities etc.
   ii. Motivating subordinates / juniors ('pep talk')
   iii. Instructing/ directing subordinates/ juniors
   iv. Expressing / recording appreciation, praising / rewarding a subordinate or junior
   v. Reprimanding / correcting / disciplining a subordinate/junior (for a lapse) ; asking for an explanation etc.

b. Subordinate / Junior ➔ Superior / Senior
   i. Responding to the above
   ii. Reporting problems / difficulties / deficiencies
   iii.Offering suggestions

PCES7201 **Analog Electronics Lab**

List of Experiments

(At least 10 out of 13 experiments should be done)

1. BJT bias circuit – Design, assemble and test.
2. JEET/MOSFET bias circuits – Design, assemble and test.
3. Design, assemble and test of BJT common-emitter circuit – D.C and A.C performance: Voltage gain, input impedance and output impedance with bypassed and un-bypassed emitter resistor.
4. Design, assemble and test of BJT emitter-follower – D.C and A.C performance: A.C. voltage gain, input impedance and output impedance.
5. Design, assemble and Test of JFET/MOSFET common-source and common-drain amplifiers – D.C and A.C performance: Voltage gain, input impedance and output impedance.
6. Frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response.
7. Differential amplifiers circuits: D.C bias and A.C operation without and with current source.
8. Study of Darlington connection and current mirror circuits.
9. OP-Amp Frequency Response and Compensation.
10. Application of Op-Amp as differentiator, integrator, square wave generator.
11. Square wave testing of an amplifier.
12. R.C phase shift oscillator/Wien-Bridge Oscillator using OP-Amp/Crystal Oscillator.
13. Class A and Class B Power Amplifier.

PCCS7209 **Object Oriented Programming Lab**

1. Programs on concept of classes and objects.(1 class)

2. Programs using inheritance.(1 class)
(i) Single inheritance
(ii) Multiple inheritance
(iii) Multi level inheritance
(iv) Use of virtual base classes

3. Programs using static polymorphism.(1 class)
(i) Function overloading
(ii) Ambiguities while dealing with function overloading

4. Programs on dynamic polymorphism.(1 class)
(i) Use of virtual functions
(ii) Use of abstract base classes

5. Programs on operator overloading.(1 class)
(i) Operator overloading using member operator functions.
(ii) Operator overloading using non member operator functions.
(iii) Advantages of using non member operator functions.

6. Programs on dynamic memory management using new, delete operators.(1 class)
7. Programs on copy constructor and usage of assignment operator.(1 class)
8. Programs on exception handling .(1 class)
9. Programs on generic programming using template function and template class.(1 class)
   Programs on file handling.(1 class)

4th Semester

BSCM1211 Discrete Mathematics

Module- I (14 Hours)
Propositional logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Proof methods and Strategies, Sequences and Summations, Mathematical Induction, Recursive definition and structural induction, Program Correction
Recurrence relation, Solution to recurrence relation, Generating functions, Inclusion and exclusion, Application of Inclusion and Exclusion Principle, Relation and their properties, Closure of relations, Equivalence relations, Partial orderings.

Module-II (13 hours)
Introduction to graph theory, Graph terminology, Representation of graphs, Isomorphism, Connectivity, Euler and Hamiltonian paths, Shortest path problems, Planar graph, Graph coloring, Introduction to trees, Application of trees, Tree Traversal, Minimum Spanning tree.

Module-III (13 hours)
Semi groups, Monoids, Groups, Subgrorups, Cosets, Lagrange theorem, Permuation groups, Group codes, isomorphism, Homomorphisms, Normal subgroups, Rings, Integral Domain and Fields.
Algebraic systems, Lattices, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algrebra, Boolean Functions and Boolean Expressions.

Text Books:

1. **Kenneth H. Rosen**, "*Discrete Mathematics and its Applications*", Sixth Edition, 2008, Tata McGraw Hill Education , New Delhi.
   Chapters: 1, 2(2.4), 4, 6(6.1, 6.2, 6.4-6.6), 7, 8, 9
2. **C. L. Liu and D. Mohaptra**, "*Elements of Discrete Mathematics*", Third Edition, 2008, Tata McGraw Hill Education, New Delhi
   Chapters: 10 (10.1- 10.10), 11(11.1 – 11.7)

Reference Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", Fifth Edition, 2005, Pearon Education, New Delhi.
2. Kolman, Busby, Ross, "Discrete Mathematics", Fifth Edition, PHI Publication.
3. J.L. Gersting, " Mathematical Structure for Computer Science: A modern treatment to Discrete Mathematics' Sixth Edition, W. H. Freeman and Macmillan (India).
4. Eric Gossett, ' Discrete Mathematics with Proof, Second Edition, Wiley India Pvt Ltd
5. Thomas Koshy, " Discrete Mathematics and Applications:, Second Edition, Elsevier Publication (India), New Delhi.
6. J.L. Mott, A.Candell & I. Bekar, Discrete Mathematics for Computer Scientists and Mathematicians, PHI.

PCCS4202 System Programming

Module I **(10 Hrs)**

Introduction: System Software, Application Software, Machine Structure, Evolution of components of a programming system (Assembler, Loader, Macros, Compiler, Formal Systems), Evolution of Operating Systems, Functions of Operating System.

Machine Structure: General Machine Structure, Approach to a new machine, Memory Registers, Data, Instructions, special features.

Machine Language: Long Way, No looping, Address Modification, Looping

Introduction to Assembly Language Program

Module II **(10 Hrs)**

Assemblers: Design Procedure, Design of Assembler, Table Processing.

Macros Language and Macro Processor: Macro Instructions, Features of a Macro Facility, Implementation.

Loaders: Loader Schemes, Design of an Absolute Loader, Direct Linking loader, Bootstrap Loader.

Module III **(12 Hrs)**

Programming Languages: Importance of High Level Languages, Features, Data Types and Data Structures, Storage Allocation and Scope Name, Accessing Flexibility, Functional Modularity, Asynchronous Operations, Extensibility and Compile time Macros.

Formal Systems: Uses of Formal Systems, Formal Specification, Formal Grammars, Backus-Naur Form, Canonic Systems, Canonic Systems vs Formal Systems

Compilers: Introduction to Compilers, Phases of a compiler(Lexical Phase, Syntax Phase, Interpretation Phase, Optimization, Code Generation, Assembly, passes of a compiler), Intermediate Form, Storage Allocation, Code Generation, Data Structure

Text Book:

Systems Programming by John J Donovan (McGraw-Hill Education)

Reference Book:

(1) System Software: An Introduction to systems programming by Leland Beck (Pearson)

(2) System Software : Nityashri,(McGraw-Hill Education)

(3) Operating System and System Programming – Dhamdhere (McGraw-Hill Education)

(4) System Programming with C and Unix.- Hoover (Pearson Education)

PCCS4203 Design and Analysis of Algorithm

Module- I **(12 Hours)**

Introduction to design and analysis of algorithms, Growth of Functions (Asymptotic notations, standard notations and common functions), Recurrences, solution of recurrences by substitution, recursion tree and Master methods, worst case analysis of Merge sort, Quick sort and Binary search, Design & Analysis of Divide and conquer algorithms.

Heapsort : Heaps, Building a heap, The heapsort algorithm, Priority Queue, Lower bounds for sorting.

Module – II **(16 Hours)**

Dynamic programming algorithms (Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence)

Greedy Algorithms - (Assembly-line scheduling, Achivity- selection Problem, Elements of Greedy strategy, Fractional knapsac problem, Huffman codes).

Data structure for disjoint sets:- Disjoint set operations, Linked list representation, Disjoint set forests.

Module – III **(12 Hours)**

Graph Algorithms: Breadth first and depth-first search, Minimum Spanning Trees, Kruskal and Prim's algorithms, single- source shortest paths (Bellman-ford and Dijkstra's algorithms), All-pairs shortest paths (Floyd – Warshall Algorithm). Back tracking, Branch and Bound.

Fast Fourier Transform, string matching (Rabin-Karp algorithm), NP - Completeness (Polynomial time, Polynomial time verification, NP - Completeness and reducibility, NP-Complete problems (without Proofs), Approximation algorithms (Vertex-Cover Problem, Traveling Salesman Problem).

Text Book:

T.H. Cormen, C.E. Leiserson, R.L. Rivest, C.Stein : Introduction to algorithms -2nd edition, PHI,2002. Chapters: 1,2,3,4 (excluding 4.4), 6, 7, (7.4.1), 8 (8.1) 15 (15.1 to 15.4), 16 (16.1, 16.2, 16.3), 21 (21.1,21.2,21.3), 22(22.2,22.3), 23, 24(24.1,24.2,24.3), 25 (25.2), 30,32 (32.1, 32.2) 34, 35(35.1, 35.2)

Reference Books:

1. Algorithms – Berman, Cengage Learning
2. Computer Algorithms: Introduction to Design & Analysis, 3rd edition-by Sara Baase, Allen Van Gelder, Pearson Education
3. Fundamentals of Algorithm-by Horowitz & Sahani, 2nd Edition, Universities Press.
4. Algorithms By Sanjay Dasgupta, Umesh Vazirani – McGraw-Hill Education
5. Algorithm Design – Goodrich, Tamassia, Wiley India.

PCCS4204 **Database Engineering**

Module1: **(12 Hrs)**

Introduction to database Systems, Basic concepts &Definitions, Data Dictionary, DBA, File-oriented system vs. Database System, Database Language.

Database System Architecture-Schemas, Sub Schemas & Instances, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models, Mapping E-R model to Relational, Network and Object Oriented Data models, types of Database systems,

Storage Strategies**:** Detailed Storage Architecture, Storing Data, Magnetic Disk, RAID, Other Disks, Magnetic Tape, Storage Access, File & Record Organization, File Organizations & Indexes, Order Indices, B+ Tree Index Files, Hashing

Module2: **(16 Hrs)**

Relational Algebra, Tuple & Domain Relational Calculus, Relational Query Languages: SQL and QBE.

Database Design :-Database development life cycle(DDLC),Automated design tools, Functional dependency and Decomposition, Dependency Preservation & lossless Design, Normalization, Normal forms:1NF, 2NF,3NF,and BCNF, Multi-valued Dependencies, 4NF & 5NF.

Query processing and optimization: Evaluation of Relational Algebra Expressions, Query optimization.

Module3: **(12 Hrs)**

Transaction processing and concurrency control: Transaction concepts, concurrency control, locking and Timestamp methods for concurrency control.

Database Recovery System: Types of Data Base failure & Types of Database Recovery, Recovery techniques

Advanced topics: Object-Oriented & Object – Relational Database, Parallel & Distributed Database, Introduction to Data warehousing & Data Mining

Text Books:

1. Database System Concepts by Sudarshan, Korth (McGraw-Hill Education)
2. Fundamentals of Database System By Elmasari &Navathe- Pearson Education

References Books:

(1) An introduction to Database System – Bipin Desai, Galgotia Publications
(2) Database System: concept, Design & Application by S.K.Singh (Pearson Education)
(3) Database management system by leon &leon (Vikas publishing House).
(4) Database Modeling and Design: Logical Design by Toby J. Teorey, Sam S. Lightstone, and Tom Nadeau, “”, 4th Edition, 2005, Elsevier India Publications, New Delhi
(5) Fundamentals of Database Management System – Gillenson, Wiley India

PCEC4202 **Digital Electronics Circuit**

MODULE – I **(11 Hours)**

1. **Number System:** Introduction to Binary Numbers, Data Representation, Binary, Octal, Hexadecimal and Decimal Number System and their Conversion. (2 Hours)
2. **Boolean Algebra and Logic Gates:** Basic Logic Operation and Identities, Algebraic Laws, NOR and NAND Gates, Useful Boolean Identities, Algebraic Reduction, Complete Logic Sets, Arithmetic Operation using 1's and 2`s Compliments, Signed Binary and Floating Point Number Representation. (4 Hours)
3. **Combinational Logic Design:** Specifying the Problem, Canonical Logic Forms, Extracting Canonical Forms, EX-OR Equivalence Operations, Logic Array, K-Maps: Two, Three and Four variable K-maps, NAND and NOR Logic Implementations. (5 Hours)

MODULE – II **(15 Hours)**

4. **Concepts in VHDL:** Basic Concepts, Using a Hardware Description Language, Defining Module in VHDL, Structural and Combinational Modelling, Binary Words, Libraries, Learning VHDL.
   (4 Hours)
5. **CMOS Logic Circuits:** Voltages as Logic Variables, Logic Delay Times: Output Switching Times, Propagation Delay, Fan-In and Fan-out, Extension to other Logic Gate.
   C-MOS Electronics, MOSFETS, The NOT Function in C-MOS: Complimentary Pairs and the C-MOS Invertors, Logic Formation Using MOSFETS: the NAND and NOR Gate, C-MOS Logic Connection, Complex Logic Gates in C-MOS: 3-input Logic Gates, A general 4-input Logic Gate, Logic Cascades. (6 Hours)
6. **Introduction to VLSI:** Introduction, Lithography and Patterning, MOSFET Design Rules, Basic Circuit Layout, MOSFET Arrays and AOI Gates, Cells, Libraries, and Hierarchical Design, Floor Plans and Interconnect Wiring. (5 Hours)

MODULE – III **(16 hours)**

7. **Logic Components:** Concept of Digital Components, An Equality Detector, Line Decoder, Multiplexers and De-multiplexers, Binary Adders, Subtraction and Multiplication. (5 Hours)
8. **Memory Elements and Arrays:** General Properties, Latches, Clock and Synchronization, Master-Slave and Edge-triggered Flip-flops, Registers, RAM and ROMs, C-MOS Memories. (6 Hours)
9. **Sequential Network:** Concepts of Sequential Networks, Analysis of Sequential Networks: Single State and Multivariable Networks, Sequential Network Design, Binary Counters, Importance of state machine. (5 Hours)

Text Books:

1. A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc.
2. Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.
3. Digital Design, Robert K. Dueck, CENGAGE Learning**.**

Reference Books:

1. Digital Principles and Applications, 6th Edition, Donald P. Leach, Albert Paul Malvino and Goutam Saha, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.
3. Digital Electronics, Principles and Integrated Circuit, Anil K. Jain, Wiley India Edition.
4. Digital Design, 3rd Edition, Moris M. Mano, Pearson Education.

PCEC7202 **Digital Electronics Circuit Lab**

List of Experiments:

(Atleast 10 experiments should be done, Experiment No. 1 and 2 are compulsory and out of the balance 8 experiments atleast 3 experiments has to be implemented through both Verilog/VHDL and hardware implementation as per choice of the student totaling to 6 and the rest 2 can be either through Verilog/VHDL or hardware implementation.)

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates, use of Universal NAND Gate.
2. Gate-level minimization: Two level and multi level implementation of Boolean functions.
3. Combinational Circuits: design, assemble and test: adders and subtractors, code converters, gray code to binary and 7 segment display.
4. Design, implement and test a given design example with (i) NAND Gates only (ii) NOR Gates only and (iii) using minimum number of Gates.
5. Design with multiplexers and de-multiplexers.
6. Flip-Flop: assemble, test and investigate operation of SR, D & J-K flip-flops.
7. Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.
8. Counters: Design, assemble and test various ripple and synchronous counters - decimal counter, Binary counter with parallel load.
9. Memory Unit: Investigate the behaviour of RAM unit and its storage capacity – 16 X 4 RAM: testing, simulating and memory expansion.
10. Clock-pulse generator: design, implement and test.
11. Parallel adder and accumulator: design, implement and test.
12. Binary Multiplier: design and implement a circuit that multiplies 4-bit unsigned numbers to produce a 8-bit product.
13. Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 3 to 12.

PCCS7203 Design and Analysis of Algorithms Lab

1. Using a stack of characters, convert an infix string to postfix string.(1 class)
2. Implement insertion, deletion, searching of a BST. (1 class)
3. (a) Implement binary search and linear search in a program

   (b) Implement a heap sort using a max heap.
4. (a) Implement DFS/ BFS for a connected graph.

   (b) Implement Dijkstra's shortest path algorithm using BFS.
5. (a) Write a program to implement Huffman's algorithm.

   (b) Implement MST using Kruskal/Prim algorithm.
6. (a) Write a program on Quick sort algorithm.

   (b) Write a program on merge sort algorithm.

   Take different input instances for both the algorithm and show the running time.
7. Implement Strassen's matrix multiplication algorithm.
8. Write down a program to find out a solution for 0 / 1 Knapsack problem.
9. Using dynamic programming implement LCS.
10. (a) Find out the solution to the N-Queen problem.

    (b) Implement back tracking using game trees.

PCCS7204 Database Engg. Lab

1. Use of SQL syntax: insertion, deletion, join, updation using SQL. (1 class)
2. Programs on join statements and SQL queries including where clause. (1 class)
3. Programs on procedures and functions. (1 class)
4. Programs on database triggers. (1 class)
5. Programs on packages. (1 class)
6. Programs on data recovery using check point technique. (1 class)
7. Concurrency control problem using lock operations. (1 class)
8. Programs on ODBC using either VB or VC++. (1 class)
9. Programs on JDBC. (1 class)
10. Programs on embedded SQL using C / C++ as host language. (1 class)