Second Year Engineering									
Third Semester									
Theory							**Practical**		
Subject Code	**Category**	**Course Name**	**Hours/week L/T**	**Credit Theory**	**University Marks**	**Internal Evaluation**	**Hours/ Week L/T**	**Credit Practical**	**Marks**
PCS3I101	PC	Switching Theory & Logic Design	3-0	3	100	50	2	1	50
PCS3I102	PC	Object Oriented Programming using JAVA	3-0	3	100	50	2	1	50
PCS3I103	PC	System Programming	3-0	3	100	50	2	1	50
PCS3I104	PC	Software Engineering	3-0	3	100	50	2	1	50
PCS3I001	PC	Discrete Structures	3-1	4	100	50			
PEK3E001/ POB3E002	HS	Engineering Economics/ Organizational Behaviour	2-1	3	100	50			
Total			19	19	600	300	8	4	200
Total Marks: 1100									
Total Credits: 23									
PCS3D001	Honours	Artificial Intelligence	4	4	100	50			
PCS3G001	Minor	Software Engineering							

Semester : 3rd

1.	PCS3D001	Honours(CP)	Artificial Intelligence	4-0-0	4
2.	PEK3E001	HS(O1)	Engineering Economics	3-0-0	3
3.	POB3E002	HS(O1)	Organizational Behavior	3-0-0	3
4.	PCS3G001	Minor(CP)	Software Engineering	4-0-0	4
5.	PCS3I001	PC(CP)	Discrete Structures	4-0-0	4
6.	PCS3I101	PC(CP)	Switching Theory & Logic Design	3-0-1	4
7.	PCS3I102	PC(CP)	Object Oriented Programming using JAVA	3-0-1	4
8.	PCS3I103	PC(CP)	System Programming	3-0-1	4
9.	PCS3I104	PC(CP)	Software Engineering	3-0-1	4
					27

PCS3I101 SWITCHING CIRCUITS AND LOGIC DESIGN

Theory L/T (Hours per week): 3/0, Credit: 3

Introduction: Logic design, transistors as switches, CMOS gates, sequential circuits,some examples.

Digital Systems: Representation of numbers, binary codes, Gray code, error-detecting and error-correcting codes, registers, binary logic, basic logic gates.

Boolean Algebra: Boolean operations, Boolean functions, algebraic manipulations, minterms and maxterms, sum-of-products and product-of-sum representations, two-input logic gates, functional completeness.

Minimization of Boolean Functions: Karnaugh map, don't-care conditions, prime implicants, Quine–McCluskey technique, Logic gates, NAND/NOR gates, Universal gates.

Combinational Circuits: Adder, subtractor, multiplier, comparator, decoders, encoders, multiplexers, demultiplexers, MUX Realization of switching functions, Parity bit generator, Code-converters, Hazards and hazard free realizations

Synchronous Sequential Circuits: Finite-state machines, latches and flip-flops (SR, D, JK, T), synthesis of clocked sequential circuits, Steps in synchronous sequential circuit design. Design of modulo-N Ring & Shift counters, Serial binary adder.

Registers and Counters: Registers and shift registers, sequential adders, binary and BCD ripple counters, synchronous counters

Algorithmic State Machines: Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

Text Book:

1. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.
2. Digital Electronics by G.K. Kharate, Oxford University Press

References:

1. Switching & Finite Automata theory – Z. Kohavi, TMH,2nd Edition.
2. An Engineering Approach To Digital Design – Fletcher, PHI.
3. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
4. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006

SWITCHING CIRCUITS AND LOGIC DESIGN LAB

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates, use of Universal NANDGate.
2. Gate-level minimization: Two level and multi level implementation of Booleanfunctions.
3. Combinational Circuits: design, assemble and test: adders and subtractors, comparators.
4. Design and Implementation of code converters, gray code to binary and BCD to seven segment display.
5. Design and Implementation of a function using MUX/ DEMUX.
6. Design of functions using encoder, decoder.
7. Flip-Flop: assemble, test and investigate operation of SR, D & J-Kflip-flops.
8. Shift Registers: Design and investigate the operation of all types of shift registers with parallelload.
9. Counters: Design, assemble and test various ripple and synchronous counters - decimal counter, Binary counter with parallelload.
10. Design of Binary Multiplier.
11. Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 1 to 10.
12. C/C++ implementation of Experiments listed at Sl. No. 1 to 10.

PCS3I102 OBJECT ORIENTED PROGRAMMING USING JAVA

Module1:-

Chapter 1-: An introduction to programming.

Different types of programming languages, Description of Compiler and Interpreter, Advantage of Object Oriented Programming, Object Oriented Programming, Features of Object Oriented Programming.

Chapter 2-: Introduction to Java.

What is Java?, Why Java?, History behind Java, Different versions of Java, Difference between C/C++ and Java, Features of Java, First Java Program, Prerequisites Before start writing a java program, Writing the program, Compiling the program, How Java program compiles?, Executing the program, How Java program executes?, What is JVM and its significance in executing a program?, Architecture of JVM.

Chapter 3-: Understanding First Program and a step forward, Understanding every term of the program, Java Tokens, Datatypes, Operators, What are Operators?, Different types of Operators, Typecasting, Control Structures and Arrays, Different types of control structures, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

Module 2: -

Chapter 1-: Introduction to Classes and Objects.

Classes, Methods, Objects, Description of data hiding and data encapsulation, Constructors, Use of static Keyword in Java, Use of this Keyword in Java, Array of Objects, Concept of Access Modifiers (Public, Private, Protected, Default).

Chapter 2-: Inheritance

Understanding Inheritance, Types of Inheritance and Java supported Inheritance, Significance of Inheritance, Constructor call in Inheritance, Use of super keyword in Java, Polymorphism, Understanding Polymorphism, Types of polymorphism, Significance of Polymorphism in Java, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching.

Chapter 3-: String Manipulations.

Introduction to different classes, String class, String Buffer, String Builder, String Tokenizer, Concept of Wrapper Classes, Introduction to wrapper classes, Different predefined wrapper classes, Predefined Constructors for the wrapper classes. Conversion of types from one type (Object) to another type (Primitive) and Vice versa, Concept of Auto boxing and unboxing.

Chapter 4:- Data Abstraction

Basics of Data Abstraction, Understanding Abstract classes, Understanding Interfaces, Multiple Inheritance Using Interfaces, Packages, Introduction to Packages, Java API Packages, User-Defined Packages, Accessing Packages, Error and Exception Handling, Introduction to error and exception, Types of exceptions and difference between the types, Runtime Stack Mechanism, Hierarchy of Exception classes, Default exception handling in Java, User defined/Customized Exception Handling, Understanding different keywords (try, catch, finally, throw, throws), User defined exception classes, Commonly used Exceptions and their details.

Chapter 5:- Multithreading
Introduction of Multithreading/Multitasking, Ways to define a Thread in Java, Thread naming and Priorities, Thread execution prevention methods. (yield(), join(), sleep()), Concept of Synchronisation, Inter Thread Communication, Basics of Deadlock, Demon Thread, Improvement in Multithreading, Inner Classes, Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class.

Module 3: -

Chapter 1:- IO Streams (java.io package)
Introduction, Byte Stream and Character Stream, Files and Random Access Files, Serialization, Collection Frame Work (java.util), Introduction, Util Package interfaces, List, Set, Map etc, List interfaces and its classes, Setter interfaces and its classes.

Chapter 2:-Applet
Introduction, Life Cycle of an Applet, GUI with an Applet, Abstract Window Toolkit (AWT), Introduction to GUI, Description of Components and Containers, Component/Container hierarchy, Understanding different Components/Container classes and their constructors, Event Handling, Different mechanisms of Event Handling, Listener Interfaces, Adapter classes.

Module 4: -

Chapter 1:- Swing (JFC)
Introduction Diff b/w awt and swing, Components Hierarchy, Panes, Individual Swings Components JLabel, JButton, JTextField, JTextArea.

Chapter 2:-JavaFX
Getting started with JavaFX, Graphics, User Interface Components, Effects, Animation, and Media, Application Logic, Interoperability, JavaFX Scene Builder 2, Getting Started with scene Builder.
Working with scene Builder.

Text Book:-

1. Programming in Java. Second Edition. OXFORD HIGHER EDUCATION. (SACHIN MALHOTRA/SAURAV CHOUDHARY)
2. CORE JAVA For Beginners. (Rashmi Kanta Das), Vikas Publication

Reference Book:-

1. JAVA Complete Reference (9th Edition) Herbalt Schelidt.

JAVA PROGRAMMING LAB

JAVA programs on:

1. Introduction, Compiling & executing a java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do, while, for etc.
4. Classes and objects.
5. Data abstraction & data hiding, inheritance, polymorphism.
6. Threads, exception handlings and applet programs
7. Interfaces and inner classes, wrapper classes, generics

PCS3I103 SYSTEM PROGRAMMING

Module I (12 Hrs)

Introduction: System Software, Application Software, components of a programming system: Assembler, Loader, Linker, Macros, Compiler, Program Development Cycle, Evolution of Operating Systems, Functions of Operating System, Machine Structure: General Machine Structure, Approach to a new machine, Memory Registers, Data, Instructions, Evolution of Machine Language: Long Way, No looping, Address Modification, Looping, Introduction to Assembly Language Program.

Module II (12 Hrs)

Assemblers: Design Procedure, Design of Assembler, Two-pass 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. Dynamic Loading and Linking, Algorithm and Data structures for Linking Loader, Linkers and Linkage Editors.

Module III (10 Hrs)

Programming Languages: Importance of High Level Languages, Features, Data Types and Data Structures, Storage Allocation and Scope Name, Accessing Flexibility, Functional Modularity, Formal Systems: Uses of Formal Systems, Formal Specification, Formal Grammars, Introduction to Compilers, passes of compiler, Phases of a compiler, Interpreter.

Module IV (06 Hrs)

Software Tools for Program Development, Editor, Design and User Interface, Programming Environment and Integrated Development Environments, Debugger Functionalities, Debug Monitors, Debugger Facilities, Debugger Internal Mechanism Operating.

Text Book:

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

Reference Book:

(1) Operating System and System Programming – Dhamdhere (McGraw-Hill Education)
(2) System Programming,by Srimanta Pal, Oxford University Press
(3) System Software, S. Chattopadhyay (Prentice-Hall India)
(4) System Programming with C and UNIX. - Hoover (Pearson Education)
(5) System Software: An Introduction to systems programming by Leland Beck (Pearson)
(6) System Software: Nityashri (McGraw-Hill Education)

SYSTEM PROGRAMMING LABORATORY

1. Programs using 8085 Microprocessor
   a. addition
   b. subtraction
   c. multiplication
   d. division
2. Program on linker using stack concept.
3. Program on design of Macro using C/C++
4. Program on design of assembler using C/C++
5. Program on design of loader using C/C++
6. Program on design of a lexical analyzer using LEX.
7. Program on design of a parser using YACC

PCS3I104 SOFTWARE ENGINEERING

Theory L/T (Hours per week): 3/0, Credit: 3

Software Process Models:

Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming, and Scrum.

Software Requirements Engineering:

Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification(SRS), IEEE 830 guidelines, Decision tables and trees.

Structured Analysis & Design: (10Hrs)

Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces.,

Coding and Software Testing Techniques:

Coding, Code Review, documentation. Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing.

Software Reliability and Software Maintenance:

Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.

Emerging Topics:

Client-Server Software Engineering, Service-oriented Architecture (SOA), Software as a Service (SaaS),

Text Book:

1. Fundamentals of Software Engineering, Rajib Mall , PHI, 2014.

Reference Books:

1. Software Engineering, A Practitioner's Approach, Roger S. Pressman ,TMG Hill.
2. Software Engineering, I. Sommerville, 9th Ed. , Pearson Education.

SOFTWARE ENGINEERING LABORATORY

Experiment1: Develop requirements specification for a given problem(The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems, see the questions section of Chap 6 of Software Engineering book of Rajib Mall)

Experiment 2: Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required)

Experiment 3: Develop structured design for the DFD model developed

Experiment 4: Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose, Argo UML, or Visual Paradigm etc. is required)

Experiment 5: Develop Sequence Diagrams.

Experiment 6: Develop Class diagrams.

Experiment 7: Develop code for the developed class model using Java.

Experiment 8: Use testing tool such as Junit.

Experiment 9: Use a configuration management tool.

Experiment 10: Use any one project management tool such as Microsoft Project or Gantt Project, etc.

PCS3I001 DISCRETE STRUCTURES

Module-1.(15 Hours)

Sets and Propositions: Principle of Inclusion and Exclusion, Mathematical induction, Propositions, Logical Connectives, Conditionals and Biconditionals, Logical Equivalences, Predicate Calculus, Quantifiers, Theory of inference, Methods of proof.Relations and Functions: properties of binary relations, Closure of relations, Warshall's algorithm, Equivalence relations, Partial ordering relations and lattices, Chains and antichains, Functions, Composition of Functions, Invertible Functions, Recursive Functions, Pigeonhole principle.

Module-2. (5 Hours)

Numeric Functions and Generating Functions: Discrete Numeric functions, Generating Functions, Recurrence Relations and Recursive Algorithms:Recurrence relations, Linear recurrence relations with constant coefficients, Solution of recurrence relations by the method of generating functions, Divide and conquer algorithms,

Module-3.(10 Hours)

Groups and Rings: groups and subgroups, Cosets and Lagrange's theorem, Codes and Group codes, Error detection and correction using Group codes, Isomorphism, Homomorphism and normal subgroups, Rings, Integral domains and Fields, Boolean Algebras: Lattices and algebraic systems, Principle of duality, Distributive and complemented lattices, Boolean functions and Boolean expressions, Simplification of logic expressions using Karnaugh Map, Design and Implementation of Digital Networks, Switching Circuits.

Module-4.(10 Hours)

Graphs and Trees: Basic terminology, Diagraphs and relations, representation of Graphs, operations on graphs, paths and circuits, graph traversals, shortest path in weighted graphs, Eulerian paths and circuits, Hamiltonian paths and circuits, Traveling sales person's problem, Planar graphs, Graph Coloring, Trees, Rooted trees, Binary search trees, Spanning trees, Minimum spanning trees, Kruskal's Algorithm, Prim's Algorithm.

Text Book:

1. C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics: A computer Oriented Approach, McGraw Hill Education (India) Private Limited, 4th Edition, 2013.

Reference Books:

1. R.K.Bisht, and H.S.Dhami, Discrete Mathmatics, Oxford University Press, First Edition, 2015
2. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw Hill, 5thed, 2003.
3. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications, to Computer Science, TataMc-Graw Hill, 2001.
4. Joe L. Mott, A. Kandel, and T. P. Baker, Discrete Mathematics for Computer Scientists & Mathematics, Prentice Hall of India, 2nd Edition, 2006.
5. N. Deo, Graph Theory with applications to Engineering & Computer Science, Prentice Hall of India, 2006.
6. S. Lipschutz, Discrete Mathematics, Tata McGraw Hill, 2005

PEK3E001 ENGINEERING ECONOMICS

Theory L/T (Hours per week):2/1, Credit: 3

Module I (12 hours)

Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics.

Demand- Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Supply-Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).

Production-Production function, Laws of returns: Law of variable proportion, Law of returns to scale

Module II (12 hours)

Cost and revenue concepts, Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).

Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.

Inflation-Meaning of inflation, types, causes, measures to control inflation.

National Income-Definition, Concepts of national income, Method of measuring national income.

Module III (12 hours)

Time value of money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence.

Evaluation of engineering projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects .

Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation (Straight line method, Declining balance method), After tax comparison of project.

Text Books

1. Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India
2. Principles of Economics, Deviga Vengedasalam; Karunagaran Madhavan, Oxford University Press.
3. Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson
4. R.Paneer Seelvan, “ Engineering Economics”, PHI
5. Ahuja,H.L., “Principles of Micro Economics” , S.Chand & Company Ltd
6. Jhingan,M.L., “Macro Economic Theory”
7. Macro Economics by S.P.Gupta, TMH

POB3E002 ORGANIZATIONAL BEHAVIOUR
Credit- 3 Class Hours - 40

Objectives:

1. To develop an understanding of the behavior of individuals and groups inside organizations
2. To enhance skills in understanding and appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations.
3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Unit	Contents	Class Hours
01	**Fundamentals of OB**: Definition, scope and importance of OB, Relationship between OB and the individual, Evolution of OB, Theoretical framework (cognitive), behavioristic and social cognitive), Limitations of OB.	6
02	**Attitude:** Importance of attitude in an organization, Right Attitude, Components of attitude, Relationship between behavior and attitude, Developing Emotional intelligence at the workplace, Job attitude, Barriers to changing attitudes. **Personality and values:** Definition and importance of Personality for performance, The Myers-Briggs Type Indicator and The Big Five personality model, Significant personality traits suitable to the workplace (personality and job – fit theory), Personality Tests and their practical applications. **Perception:** Meaning and concept of perception, Factors influencing perception, Selective perception, Attribution theory, Perceptual process, Social perception (stereotyping and halo effect). **Motivation:** Definition & Concept of Motive & Motivation, The Content Theories of Motivation (Maslow's Need Hierarchy & Herzberg's Two Factor model Theory), The Process Theories (Vroom's expectancy Theory & Porter Lawler model), Contemporary Theories – Equity Theory of Work Motivation.	10
03	**Foundations of Group Behavior:** The Meaning of Group & Group behavior & Group Dynamics, Types of Groups, The Five – Stage Model of Group Development. **Managing Teams:** Why Work Teams, Work Teams in Organization, Developing Work Teams, Team Effectiveness & Team Building. **Leadership:** Concept of Leadership, Styles of Leadership, Trait Approach Contingency Leadership Approach, Contemporary leadership, Meaning and significance of contemporary leadership, Concept of transformations leadership, Contemporary theories of leadership,	9

Success stories of today's Global and Indian leaders.

04	**Organizational Culture** : Meaning & Definition of Organizational Culture, creating & Sustaining Organizational Culture, Types of Culture (Strong vs. Weak Culture, Soft Vs. Hard Culture & Formal vs. Informal Culture), Creating Positive Organizational Culture, Concept of Workplace Spirituality.	**8**
05	**Organizational Change:** Meaning, Definition & Nature of Organizational Change, Types of Organizational Change, Forces that acts as stimulants to change. Implementing Organizational Change : How to overcome the Resistance to Change, Approaches to managing Organizational Change, Kurt Lewin's-Three step model, Seven Stage model of Change & Kotter's Eight-Step plan for Implementing Change, Leading the Change Process, Facilitating Change, Dealing with Individual & Group Resistance, Intervention Strategies for Facilitating Organizational Change, Methods of Implementing Organizational Change, Developing a Learning Organization.	**7**

Reference Books

1. Understanding Organizational Behaviour, Parek, Oxford
2. Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.
3. Organizational Behaviour, K. Awathappa,HPH.
4. Organizational Behaviour, VSP Rao, Excel
5. Introduction to Organizational Behaviour, Moorhead, Griffin, Cengage.
6. Organizational Behaviour, Hitt, Miller, Colella, Wiley

HONOURS SUBJECT

PCS3D001 ARTIFICIAL INTELLIGENCE

Module 1 (12Hrs)

What is Artificial Intelligence? AI Technique, Level of the Model,Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-first Search, Problem Reduction, Constraint Satisfaction, Means-ends Analysis,**Knowledge Representation:** Representations and Mappings, Approaches to Knowledge Representation, **Using Predicate Logic**: Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural Deduction.**Using Rules**: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning, Matching, Control Knowledge.**Symbolic Reasoning Under Uncertainty**: Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver, Depth-first Search, Breadth-first Search.**Weak and Strong Slot-and-Filler Structures**: Semantic Nets, Frames, Conceptual DependencyScripts, CYC.

Module 2(10Hrs)

Game Playing: The Minimax Search Procedure, Adding Alpha-beta Cutoffs, Iterative Deepening.**Planning**: The Blocks World, Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical PlanningOther Planning Techniques.**Understanding**: What is Understanding, What Makes Understanding Hard?, Understanding as Constraint Satisfaction.**Natural Language Processing**: Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking.

Module 3 (8Hrs)

Learning: Rote Learning, Learning by Taking Advice, Learning in Problem-solving, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning. **Expert Systems**: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Text Book:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009

References:

1. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

MINOR SUBJECT

PCS3G001 SOFTWARE ENGINEERING

Theory L/T (Hours per week): 3/0, Credit: 3

Software Process Models:
Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming, and Scrum.

Software Requirements Engineering:
Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification(SRS), IEEE 830 guidelines, Decision tables and trees.

Structured Analysis & Design: (10Hrs)
Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces.,

Coding and Software Testing Techniques:
Coding, Code Review, documentation. Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing.

Software Reliability and Software Maintenance:
Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.

Emerging Topics:
Client-Server Software Engineering, Service-oriented Architecture (SOA), Software as a Service (SaaS),

Text Book:

1. Fundamentals of Software Engineering, Rajib Mall , PHI, 2014.

Reference Books:

1. Software Engineering, A Practitioner's Approach, Roger S. Pressman ,TMG Hill.
2. Software Engineering, I. Sommerville, 9th Ed. , Pearson Education.

Fourth Semester									
	Theory						Practical		
Code	**Course Name**		**Hours/ week L/T**	**Credit Theory**	**University Marks**	**Internal Evaluation**	**Hours/ Week L/T**	**Credit Practical**	**Marks**
HS	Applied Mathematics III		3-0	3	100	50			
PC	Computer Organization & Architecture		3-0	3	100	50	2	1	50
PC	Design & Analysis of Algorithms		3-0	3	100	50	2	1	50
PC	Database System		3-0	3	100	50	2	1	50
PC	Formal Language & Automata Theory		3-0	3	100	50	2	1	50
HS	Engineering Economics/ Organizational Behavior		2-1	3	100	50			
	*Skill Project and Hands on						6	3	100
Total			18	18	600	300	14	7	300
Total Marks: 1200									
Total Credits: 25									
Honours		Data Analytics	4	4	100	50			
Minor		Database System / Computer Organization & Architecture							

Semester : 4th

1.	PCS4D001 Honours(CP)	Data Analytics	4-0-0	4
2.	PMA4E001 HS(CP)	Applied Mathematics - III	3-0-0	3
3.	PEK4E002 HS(O1)	Engineering Economics	3-0-0	3
4.	POB4E003 HS(O1)	Organizational Behavior	3-0-0	3
5.	PCS4G001 Minor(O3)	Database System	4-0-0	4
6.	PCS4G002 Minor(O3)	Computer Organization & Architecture	4-0-0	4
7.	PCS4I101 PC(CP)	Computer Organization & Architecture	3-0-1	4
8.	PCS4I102 PC(CP)	Design & Analysis of Algorithms	3-0-1	4
9.	PCS4I103 PC(CP)	Database System	3-0-1	4
10.	PCS4I104 PC(CP)	Formal Language & Automata Theory	3-0-1	4
11.	PCS4I201 PC(CP)	Skill Project and Hands on	0-0-3	3
				26

PMA4E001 APPLIED MATHEMATICS - III

Module-I

Complex Analysis:

Analytic function, Cauchy-Riemann equations, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's series, Maclaurin's series, Laurent's series, Singularities and zeros.

Module-II

Complex Analysis:

Residue integration method, evaluation of real integrals

Numerical Methods:

Errors of numerical results, error propagation,., Lagrange Interpolation, Newton divided difference interpolation, Newton's forward and backward interpolation, Spline interpolation.

Module-III

Numerical Methods:

Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss Integration formulas.
Solution of ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods, multi step methods, Methods for system and higher order ordinary differential equations.

Module-IV

Probability Theory and Its Applications: Probability, Random variables, Probability distributions, Mean and variance; Features of Probability Distribution: Binomial, Poisson, Uniform and Normal distribution, Distribution of several random variables.

Statistical Techniques and Its Applications: Scope of Statistics, Random sampling, Sampling Distribution,Correlation analysis, Regression Analysis,Fitting Straight Lines, Estimation of Parameters, Statistical Hypothesis.

Text books:

1. E. Kreyszig," Advanced Engineering Mathematics:,Tenth Edition, Wiley India
2. S.Pal and S.C. Bhunia, "Engineering Mathematics" Oxford University Press
3. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd

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

PCS4I101 COMPUTER ORGANIZATION AND ARCHITECTURE

Module – I (06 Hrs)

Basic structures of Computers: Computer Architecture vs. Computer Organization, Functional units, Operational concepts, Registers, Bus and Bus organization, Memory location and addresses, Big-endian and Little-endian representation.

Module – II (14 Hrs)

Basic Processing Units: Fundamental concepts, Instruction format, Instruction set, Addressing modes. Instruction Sequencing, Execution cycle, Hardwired control, Micro programmed control.

Memory System: Basic Concepts, Memory hierarchy, Main Memory, Secondary storage, Cache memory.

Module – III (8 Hrs)

Arithmetic: Addition and Subtraction of signed and unsigned numbers, Multiplication of signed and unsigned numbers, Booth Multiplier, Array Multiplier, Integer Division, Floating- point Numbers and operations.

Module – IV (12 Hrs)

Microprocessors, Instruction set, Assembly Language Programming, Stack, Subroutine, Interrupt, Accessing I/O devices, Standard I/O Interfaces- RS-232C, IEEE-488, USB, Data Transfer techniques.

Text Books:

1. Computer Organization: Carl Hamacher, Zvonkovranesic, Safwat Zaky, McGraw Hill
2. Computer system Architecture: Morris M. Mano PHI.

Reference Book:

1. Computer Architecture: Parhami, Oxford University Press
2. Computer Architecture and Organization: William Stallings, Pearson Education.
3. Computer Architecture and Organization: John P. Hayes McGraw Hill.
4. Computer Architecture and Organization: An Integrated Approach, Murdocca, Heuring Willey India.
5. Computer Organization and Design Hardware/ Software Interface: David A. Patterson, John L. Hennessy, Elsevier.

COMPUTER ORGANIZATION AND ARCHITECTURE LAB

1. (a) Identification of different components of a PC.
   (b) Assembling & disassembling of a PC.

2. Study of different troubleshooting of a dot matrix printer using LX 1050+ Printer Trainer Module.

3. Study of the functions of SMPS using SMPS Trainer Kit.
   (a) Study of SMPS with Single Output under Line Regulation.
   (b) Study of SMPS with Multi Output under Line Regulation.
   (c) Study of SMPS with Single Output under Load Regulation.

4. Study of different troubleshooting of CPU using CPU Trainer Module.

5. Familiarization of different types of byte addressing instruction using 8085 simulator.

6. Study of assembly Language program in PC using 8086 architecture.

7. Design of digital circuits (H/A, F/A, Decoder & Encoder) in VHDL using Active VHDL.

8. Design of digital circuits (MUX, DEMUX & ALU) in VHDL using Active VHDL.

9. Write a C/C++ program to perform signed bit multiplication using Booth's algorithm.

10. Write a C/C++ program for IEEE-754 floating point representation and perform Addition/Subtraction.

PCS4I104 FORMAL LANGUAGE AND AUTOMATA THEORY

Module – I (10 Hrs)

Mathematical preliminaries: Alphabet, String, Languages, Grammars, Strings and operations on strings.
Finite Automata: Definition, Basic model, Types of Finite Automata, NFA vs. DFA, NFA to DFA conversion, Eliminating ε-transitions from NFA, NFA as a language acceptor, Minimization of Finite Automata, Design of DFA.

Module – II (10 Hrs)

Regular Expressions: Operators in Regular expressions, Building Finite Automata from Regular expression, Arden's theorem, Building Regular expression from Finite Automata, Pumping Lemma for Regular languages, Closure properties of Regular languages.CYK algorithm.
Context Free Grammars: Derivation and Parse Trees, Ambiguity, Elimination of Ambiguity, Simplification of a CFG, Chomsky and Greibach Normal Forms. Closure and Decision Properties of CFL, Pumping Lemma for CFL.

Module – III (12 Hrs)

Push Down Automata: Basic Model, Components, Moves of a PDA, ID of a PDA, Design of a PDA, PDA to CFG and CGA to PDA conversion.
Turing Machines: Model, Components, move of a TM, ID of TM, design of a TM, Recursively Enumerable Languages, Variation of Turing Machine model, Universal Turing Machine and Undecidable problems, Undecidability of Post correspondence problem.
Linear Bounded Automata and Context Sensitive Languages, Chomsky's Hierarchy of Languages.

Module – IV (08 Hrs)

Primitive Recursive functions: μ- Recursive functions, Cantor and Godel numbering, Ackermann's function, Excursiveness of Ackermann and Turing computable functions. Church Turing hypothesis, Recursive and Recursively Enumerable sets, NP Completeness: P and NP, NP complete and NP Hard problems.

Text Books:

1. Introduction to Automata Theory, Languages and Computation: J. E. Hopcroft, J. D Ullman, Pearson Education.
2. Formal Language and Automata Theory, C. K. Nagpal, Oxford University Press.

Reference Books:

1. Introduction to Formal Languages, Automata Theory and Computation, K. Kirthivasan, Rama R, Pearson Education.
2. Introduction to Languages and the Theory of Computation, Martin, Tata Mc-Graw Hill.
3. Theory of Computation, V. Kulkarni, Oxford University Press.
4. Elements of Theory of Computation, Lewis, PHI.
5. Introduction to the theory of computation, Michael Sipser, Cengage Learning.

FORMAL LANGUAGE & AUTOMATA THEORY LAB

Implementation of following concept of Theory of computation using C-program:

1. DFAs for some regular languages
2. ϵ-NFA to DFA conversion
3. NFA to DFA conversion
4. Program for DFA minimization
5. PDAs for some Context free languages
6. CYK parsing algorithm for some specific Context free grammars
7. Turing machine for some Recursively Languages

PCS4I102 DESIGN AND ANALYSIS OF ALGORITHM

Module- I (10 Hours)

Introduction, Definition, Chrematistics of algorithm, Growth of Functions, Asymptotic analysis, Amortized analysis, standard notations and common functions, Recurrences, solution of recurrences by substitution, recursion tree, induction method, and Master methods, Algorithm design techniques, worst case analysis of Merge sort, Quick sort and Binary search, Design & Analysis of Divide and conquer algorithms.

Module – II (10 Hours)

Heapsort mechanism, Heaps, Building a heap, The heapsort algorithm, Priority Queue, Lower bounds for sorting. Dynamic programming methodology, Elements of dynamic programming, Matrix-chain multiplication, Longest common subsequence, Greedy Algorithms, Elements of Greedy strategy, Assembly-line scheduling, Activity selection Problem, Fractional knapsack problem, Huffman codes).

Module – III (10 Hours)

Data structure for disjoint sets, Disjoint set operations, Linked list representation, path compression, Disjoint set forests. Graph Algorithms and their characteristics, Breadth first search and depth-first search, Minimum Spanning Trees, Kruskal algorithm and Prim's algorithms, single- source shortest paths (Bellman-ford algorithm and Dijkstra's algorithms), All-pairs shortest paths (Floyd – Warshall Algorithm).

Module – IV (10 Hours)

Back tracking, Branch and Bound, Eight Queen problem, string matching algorithms, naïve string matching algorithm, Rabin-Karp algorithm, Knuth–Morris–Pratt algorithm, NP - Completeness (Polynomial time, Polynomial time verification, NP - Completeness and reducibility, NP-Complete problems (without Proofs), Approximation algorithms characteristics, Traveling Salesman Problem.

Text Book:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest, C.Stein : **Introduction to Algorithms**, 2nd Edition, PHI Learning Pvt. Ltd.
2. H. Bhasin: **Algorithms, Design and Analysis,** First Edition, Oxford Higher Education.

Reference Books:

1. Sanjay Dasgupta, Umesh Vazirani: **Algorithms**, McGraw-Hill Education.
2. Horowitz & Sahani: **Fundamentals of Algorithm**, 2nd Edition, Universities Press.
3. Goodrich, Tamassia: **Algorithm Design**, Wiley India.

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.

- *College should conduct at least one NSDC program under this category.

PCS4I103 DATABASE SYSTEM

Module I: (10 Hours)

Introduction to database Systems, advantages of database system over traditional file system, Basic concepts & Definitions, Database users, Database Language, Database System Architecture, Schemas, Sub Schemas, & Instances, database constraints, 3-level database architecture, Data Abstraction, Data Independence, Mappings, Structure, Components & functions of DBMS, Data models.

Module II: (10 Hours)

Entity relationship model, Components of ER model, Mapping E-R model to Relational schema, Network and Object Oriented Data models, 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 Data Dictionary

Module III: (10 Hours)

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, Join strategies, 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, Query cost estimation.

Module IV: (10 Hours)

Transaction processing and concurrency control: Transaction concepts, properties of transaction, concurrency control, locking and Timestamp methods for concurrency control schemes. Database Recovery System, Types of Data Base failure & Types of Database Recovery, Recovery techniques. fundamental concepts on Object-Oriented Database, Object relational database, distributed database, Parallel Database, Data warehousing & Data Mining and Big data and NoSQL.

Text Books:

1. Sudarshan, Korth: **Database System Concepts**, 6th edition, McGraw-Hill Education.

References Books:

1. Elmasari &Navathe: **Fundamentals of Database System**, Pearson Education.
2. Ramakrishnan: **Database Management Systems**, McGraw-Hill Education.
3. Andrew S. Tanenbaum: **Modern Operating Systems**, 3rd Edition, Pearson Education.
4. Terry Dawson, Olaf Kirch: **Linux Network Administrator's Guide**, 3rd Edition, O'Reilly Media

DATABASE SYSTEM 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)

HONOURS SUBJECT

PCS4D001 DATA ANALYTICS (4-0-0)

(I) Predictive Analytics

1.Linear Methods for Regression and Classification: Overview of supervised learning,Linear regression models and least squares, Multiple regression, Multiple outputs, Subset selection , Ridge regression, Lasso regression , Linear Discriminant Analysis , Logistic regression , Perceptron learning algorithm.

2.Neural Networks(NN) , Support Vector Machines(SVM),and K-nearest Neighbor: Fitting neural networks, Back propagation,Issues in training NN, SVM for classification, Reproducing Kernels, SVM for regression, K-nearest –Neighbour classifiers(Image Scene Classification)

3.Unsupervised Learning and Random forests: Association rules,Cluster analysis,Principal Components,Random forests and analysis.

(II) Inferential Statistics and Prescriptive analytics

4.Assessing Performance of a classification Algorithm(t-test,McNemar's test,Paired t-test,paired F-test),Analysis of Variance, Creating data for analytics through designed experiments.

Introduction to big data and Challenges for big data analytics.

(III)Lab work

5. Implementation of following methods using R or Matlab (One of the class tests with a weightage of 15 marks be used to examine these implementations):
Simple and multiple linear regression,Logistic regression,Linear discreminant analysis,Ridge regression, Cross-validation and boot strap, Fitting classification and regression trees, K-nearest neighours, Principal component analysis ,K-means clustering.

RecommendedTexts:
1.Trevor Hastie, Robert Tibshirani,Jerome Friedman *, The Elements of Statistical Learning-Data Mining, Inference,and Prediction*,Second Edition , Springer Verlag, 2009.
[chapters: 2,3(3.1-3.4,3.6),4(4.3-4.5),11(11.3-11.6),12(12.1-12.3),13.3,14(14.1-14.3.8,14.5.1),15]
2. **(For unit 5 only**) -G.James,D.Witten,T.Hastie,R.Tibshirani-*An introduction to statistical learning with applications in R*,Springer,2013.(2.3,3.6.1-3.6.3,4.6.1-4.6.3,5.3,6.6.1,8.3.1,8.3.2,10.4,10.5.1)
3 (**for unit 4 only**).E.Alpaydin*, Introduction to Machine Learning*, Prentice Hall Of India,2010,(Chapter-19)

Refeerences
1.C.M.Bishop –Pattern Recognition and Machine Learning,Springer,2006
2. L.Wasserman-All of statistics
Texts 1 and 2 and reference 2 are available on line.

Fifth Semester								
	Theory					Practical		
Code	**Course Name**	**Hours/week L/T**	**Credit Theory**	**University Marks**	**Internal Evaluation**	**Hours/week L/T**	**Credit Practical**	**Marks**
PC	Operating System	3-0	3	100	50	2	1	50
PC	Computer Graphics	3-0	3	100	50	2	1	50
PC	Advanced Computer Architecture	3-0	3	100	50	2	1	50
PE	Advanced JAVA Programming/ Internet of Things/Software Testing/Parallel Algorithms	3-1	4	100	50			
OE	Cloud Computing/ Data mining & Data Warehousing/ Information Retrieval	3-1	4	100	50			
PC	Advance Lab-I					8	4	200
Total		17	17	500	250	14	7	350
Total Marks: 1100								
Total Credits: 24								
Honours	Real Time Systems	4	4	100	50			
Minor	Operating Systems							

Third Year Engineering

Semester : 5th

1.	PCS5D001	Honours(CP)	Real Time Systems	4-0-0	4
2.	PCS5G001	Minor(CP)	Operating Systems	4-0-0	4
3.	PCS5H001	OE(O2)	Cloud Computing	4-0-0	4
4.	PCS5H002	OE(O2)	Data mining & Data Warehousing	4-0-0	4
5.	PCS5H004	OE(O2)	Information Retrieval	4-0-0	4
6.	PCS5I001	PC(CP)	Advanced Computer Architecture	3-0-1	3
7.	PCS5I101	PC(CP)	Operating Systems	3-0-1	4
8.	PCS5I102	PC(CP)	Computer Graphics	3-0-1	4
9.	PCS5I201	PC(CP)	Advance Lab - I	0-0-4	4
10.	PCS5J101	PE(O3)	Advanced JAVA Programming	4-0-0	4
11.	PCS5J102	PE(O3)	Internet of Things	4-0-0	4
12.	PCS5J103	PE(O3)	Software Testing	4-0-0	4
13.	PCS5J104	PE(O3)	Parallel Algorithms	4-0-0	4
					28

PCS5G001 OPERATING SYSTEM (3-0-1)

MODULE-I **(10 Hours)**

Overview Operating System, Simple Batch Processing Systems, Multiprogramming and Time Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real- time Systems.

Operating System Structures: Operating System Services, System components, Protection system, Operating System Services, system calls, Process Concept, Process Scheduling, Operation on Processes, Inter-process communication, Examples of IPC Systems, Multithreading Models, Threading Issues, Process Scheduling Basic concepts, scheduling criteria, scheduling algorithms, Thread Scheduling.

MODULE-II **(12 Hours)**

Process Coordination, Synchronization, Critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors. Deadlocks, System model, Deadlock Characterization, Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, recovery from Deadlock. Memory Management strategies, Logical versus Physical Address space, swapping, contiguous Allocation, Paging, Segmentation. Virtual Memory: Background, Demand paging, performance of Demand paging, Page Replacement, Page Replacement Algorithms. Allocation of frames, Thrashing, Demand
Segmentation.

MODULE-III **(08 Hours)**

Recovery, Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, I/O System Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Request to Hardware Operation.

MODULE-IV **(10 Hours)**

File system, file structure, Directory Structure, Allocation Methods, Basic concepts of Linux system, administration requirements, setting up Linux multi-server setup, setting up of local network services, domain name systems, Virtualization concepts, classification, VM ware and Hypervisor concepts.

TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: **Operating System Concepts,** 8th edition, Wiley-India, 2009.
2. Naresh Chouhan**: Principles of Operating System,** Oxford University Press.
3. Dhamdhare: **Operating Systems: A Concept**, 3rd Edition, Tata McGraw Hill Education India

REFERENCE BOOK:

1. William Stallings: **Operating Systems,** PHI Learning Pvt. Ltd.
2. H.M. Deitel, P. J. Deitel, D. R. Choffnes: **Operating Systems,** 3rdEdition, Pearson Education.
3. Andrew S. Tanenbaum: **Mordern Operating Systems,** 3rdEdition, PHI Learning Pvt. Ltd.

OPERATING SYSTEM LABORATORY

1. Basic UNIX Commands.
2. Linux Administrative commands.
3. UNIX Shell Programming.
4. Programs on process creation and synchronization, inter process communication including shared memory, pipes and messages. (DinningPhilosopher problem / Cigarette Smoker problem / Sleeping barber problem)
5. Programs on UNIX System calls.
6. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing)
7. Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention
8. Program for FIFO, LRU, and OPTIMAL page replacement algorithm.
9. Android Programming for mobile application.

PCS5I102 COMPUTER GRAPHICS (3-0-1)

Module – I (12 hours)

Overview of Graphics System: Video Display Units, Raster-Scan and Random Scan Systems, Graphics Input and Output Devices.
Output Primitives: Line drawing Algorithms: DDA and Bresenham's Line Algorithm, Circle drawing Algorithms: Midpoint Circle Algorithm and Bresenham's Circle drawing Algorithm.
Two Dimensional Geometric Transformation: Basic Transformation (Translation, Rotation, Scaling) Matrix Representation, Composite Transformations, Reflection, Shear, Transformation between coordinate systems.

Module – II (12 hours)

Two Dimensional Viewing: Window-to- View Port Coordinate Transformation.
Line Clipping (Cohen-Sutherland Algorithm) and Polygon Clipping (Sutherland-Hodgeman Algorithm)
Aliasing and Antialiasing, Half Toning, Thresholding, Dithering.
Polygon Filling: Seed Fill Algorithm, Scan line Algorithm.
Two Dimensional Object Representations: Spline Representation, Bezier Curves, B-Spline Curves.
Fractal Geometry: Fractal Classification and Fractal Dimension.

Module – III (8 hours)

Three Dimensional Geometric and Modeling Transformations: Translation, Rotation, Scaling, Reflections, shear, Composite Transformation.
Projections: Parallel Projection, Perspective Projection.
Visible Surface Detection Methods: Back-Face Detection, Depth Buffer, A- Buffer, Scan- Line Algorithm, Painters Algorithm.

Module – IV (8 hours)

Illumination Models: Basic Models, Displaying Light Intensities.
Surface Rendering Methods: Polygon Rendering Methods: Gouraud Shading, Phong Shading.
Computer Animation: Types of Animation, Key frame Vs. Procedural Animation, Methods of Controlling Animation, Morphing.
Introduction to Virtual Reality and Augmented Reality.

Textbook:

1. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education.

Reference Books:

1. Computer Graphics Principle and Practice, J.D. Foley, A. Dam, S.K. Feiner, Addison Wesley.
2. Procedural Elements of Computer Graphics, David Rogers, TMH.
3. Computer Graphics: Algorithms and Implementations, D.P Mukherjee, D. Jana, PHI.
4. Computer Graphics, Z. Xiang, R. A. Plastock, Schaum's Outlines, McGrow Hill.
5. Computer Graphics, S. Bhattacharya, Oxford University Press.

COMPUTER GRAPHICS LABORATORY

1. Implementation of DDA and Bresenham's Line drawing algorithms.
2. Implementation of Midpoint & Bresenham's circle drawing algorithms.
3. Implementation of Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
4. Implementation of Composite 2D Transformations
5. Implementation of Cohen Sutherland 2D line clipping and Windowing
6. Implementation of Sutherland – Hodgeman Polygon clipping Algorithm
7. Implementation of Three dimensional transformations - Translation, Rotation, Scaling
8. Implementation of Composite 3D transformations
9. Implementation of B-Spline & Bezier Curves.
10. Implementations of fractals.

PCS5I001 ADVANCED COMPUTER ARCHITECTURE (3-0-1)

Module – I (18 Hrs)

Microprocessor and Microcontroller, RISC and CISC architectures, Parallelism, Pipelining fundamentals, Arithmetic and Instruction pipelining, Pipeline Hazards, Superscalar Architecture, Super Pipelined Architecture, VLIW Architecture, SPARC and ARM processors.

Module – II (06 Hrs)

Basic Multiprocessor Architecture: Flynn's Classification, UMA, NUMA, Distributed Memory Architecture, Array Processor, Vector Processors.

Module – III (08 Hrs)

Interconnection Networks: Static Networks, Network Topologies, Dynamic Networks, Cloud computing.

Module –IV (08 Hrs)

Memory Technology: Cache, Cache memory mapping policies, Cache updating schemes, Virtual memory, Page replacement techniques, I/O subsystems.

Text Book

1. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.
2. Computer Organization: Carl Hamacher, Zvonkovranesic, Safwat Zaky, McGraw Hill

References:

1. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw-Hill.
2. K. Hwang and F. A. Briggs, Computer Architecture and Parallel Processing, McGraw Hill.
3. Computer Architecture: Parhami, Oxford University Press
4. Dezso Sima, Terence Fountain, and Peter Kacsuk, Advanced Computer Architecture: A Design Space Approach, Addison Wesley.
5. John Paul Shen and Mikko Lipasti, Modern Processor Design, Tata McGraw Hill.

ADVANCED COMPUTER ARCHITECTURE LAB
(Using Simplescalar Simulator)

Introduction
These lab assignments are designed to learn and perform hardware simulations usingSimplescalar.

Lab Assignment

Experiment 1: Program behavior (Instruction Profiling)
Download different benchmarks programs from internet and run the profiling simulator for them to find out the distribution of instruction classes. Test for the following questions.
1. Is your benchmark memory intensive or computation intensive?
2. Is your benchmark mainly using integer or floating point?
3. What percentage of the instructions executed are conditional branches?

Experiment 2: Branch Predictor Test
In this experiment branch prediction simulator (sim-bpred) can be used to investigate the effects of branch predictors on the execution of the benchmark Programs. This simulator allows you to simulate 6 different types of branch predictors. You can see the list of them by looking at the menu 'branchpredictor type' for the branch prediction simulator sim-bpred.

Experiment 3: In-order versus out-of-order
Conduct experiments to find out how the increase in the parallelism in processinginstructions affect the CPI of your processor, and how you can improve the performance of memory reference instructions. In all experiments you will use the default cache and branch predictor configurations.

Experiment 4 and 5: In-order and out-of-order issue.
Experiment with the width of the pipeline by running the simulation with the following combinations of parameters. Measure CPI and total no of cycles.
- Pipeline width 1, in-order and out-of-order execution (out-of order execution is default, in-order must be selected explicitly, see the SimpleScalar manual for instructions on how to do this).
- Pipeline width 4, in-order and out-of-order execution
- Pipeline width 8, in order and out of order execution

Memory references
Run the sim-outorder simulator varying the number of memory ports available: 1,2 and 4. Use a pipeline width of 4. What is the impact on CPI on the increase in available memory ports?

Assignment 5: Cache Performance
Use a single run of sim-cheetah to simulate the performance of the following cache configurations for the benchmark you previously selected.
- least-recently-used (LRU) replacement policy
- 8 to 1024 sets
- 1-way to 8-way associativity
- 32-byte cache blocks

Assignment 6, 7 and 8: Test the Performance for other cache replacement policies like Least Frequently Used(LFU) and Random Replacement with different cache mapping techniques.

Assignment 9 and 10: Testing Relation of block size, miss ratio and mean access time

Run simulations for your benchmark with sim-outorder, using a unified L1 cache with a size of 32 KB, associativity 2 and block sizes 16, 32, 64, 128, 256 bytes. The L2 data cache should be 512 KB with block size of at least 256 (choose reasonable parameters).

References:

SimpleScalaris an open source tool and is available for download together with various tools and utilities including detailed documentation from
http://www.simplescalar.com/

PCS5J101 ADVANCED JAVA PROGRAMING (4-0-0)

Module1:-

An introduction to Network Programming.

Basics of Networking, Introduction to Socket Programming, Remote Method Invocation, Java Mail API, A small chatting application using Network Programming.

Introduction to Web Application and its programming.

Description about Web application, Client, Server (Apache Tomcat/ WebLogic/ GlassFish), An Introduction to client side programming (HTML5/CSS3/JavaScript/JQuery), An Introduction to XML/JSON.

Module2:-

Basics of JDBC

Introduction to JDBC, Need of JDBC, JDBC Drivers (4 types), Architecture of JDBC, Components of JDBC (Classes and Interfaces).

Programming with JDBC

Creating a DATABASE (MS- ACCESS/ORACLE/MySQL (for Type-3 and Type-4 connection), First Program to connect to the DATABASE created, Loading the Driver, Establishing the Connection, Creating Statements (Statement/PreparedStatement/CallableStatement), Executing a SQL Query, Different types of SQL Queries, Simple Statement, Atomic Statement, Pre-Compiled Statement, SQL Statements for stored Procedures.

JDBC Program to retrieve data from DATABASE.

Introduction to Result Set, Result Set with Statement Interface, Result Set with Prepared Statment Interface, Bidirectional Result Set, Result Set Scroll ability Type, Result Set Updatabiltiy Type, Updating data to the database using Result Set, Result Set Metadata, Executing Stored Procedures Using Callable Statement.

Module3:-

Introduction to Servlets.

What is Servlet, Advantage of Servlet Over Applets and CGI, Strengths of Servlet, Architecture of Web Application, Web Servers and its Containers, Role of servlet in Web application development, Understanding servlet-api, Understating HTTP protocol and communication between HTML-SERVLET.

Getting Deep to Servlets.

Types of Servlet, Difference between HttpServlet and GenericServlet, Life cycle of Servlets and different life cycle methods, Difference between doGet() and doPost(), Servlet Generating Html output, Collecting Client submitted data in a Servlet.

Servlet communications.

Servlet to DBMS communication using type-4 connection, Servlet to DBMC communication using JDBC connection pooling, Servlet communication with other servlets (Servlet Chaining), Servlet communication with JSP or HTML page (sendRedirect(), Difference between sendRedirect() and RequestDispatcher forward(), Understanding ServletConfig.

Conclusion to Servlets.

Servlet Filters and wrappers, Servlet Listeners, Session Tracking, Cookies, HttpSession, HTML hidden form filed element, URL rewriting, Annotation based servlet programs, Web Security with servlets, Servlet code for file uploading and downloading, Servlet code for mailing.

Module4:-

Java Server Pages: -

Introduction to JSP, Scope of JSP, Anatomy of a JSP program, Execution of a JSP program, Significance of JSP Engine, Built in objects of JSP, Significance of JSP Elements, Scripting Elements, Scriptlets, Declaration, Expression, Directives and Action Elements, Page Directive, Include Directive, Taglib Directive, Forward action element, Include, Param, useBean with introduction to beans, setProperty, getProperty

Miscellaneous

Introduction to JNDI, Introduction to web services (SOAP/SOA), Rest API, An introduction to JSTL, CORBA Architecture, Facelets, JSF, AJAX Programming, Struts/Springs, Hibernates.

Text book:-

1. Advanced Java Programming, Uttam K. Roy, Oxford University Press.

Reference Book:-

1. Black book, Kogent Learning Solution Inc.
2. Java 2: The Complete Reference by Herbert Schildt, Fifth Edition Paperback

PCS5J102 INTERNET OF THINGS (4-0-0)

Module 1

Introduction: Definition – Foundations – Challenges and Issues - Identification - Security. Components in internet of things: Control Units – Sensors – Communication modules –Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks –Mobile Internet – Wired Communication-IoT Platform Overview-Raspberry pi-Arduino boards.

Module2

IoT Protocols: Protocol Standardization for IoT-M2M and WSN Protocols-SCADA and RFID Protocols-Issues with Iot Standardization-Protocols-IEEE 802.15.4-BACNet Protocol-Zigbee,Architecture - Network layer – APS Layer – Security.

Module 3

Resource Management in the Internet of Things: Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines -Software Agents for Object – Data Synchronization- Types of Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomymand Agility by the Internet of Things - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behaviour of Objects.

Module 4

Case Study and IoT Application Development: IoT applications in home- infrastructuressecurity-Industries- IoT electronic equipments. Use of Big Data and Visualization in IoTIndustry 4.0 concepts - Sensors and sensor Node –Interfacing using Raspberry Pi/Arduino- Web Enabled Constrained Devices.

Module 5

Web of Things: Web of Things versus Internet of Things-Architecture Standardization for WoT-Platform Middleware for WoT- WoT Portals and Business Intelligence-Cloud of Things:Grid/SOA and Cloud Computing-Cloud Standards –Cloud of Things Architecture-Open Source e-Health sensor platform.

Programming assignments are mandatory.Develop schemes for the applications of IOT in real time scenarios.Design business Intelligence and Information Security for WoT.

Text Books:

1. Honbo Zhou, "The Internet of Things in the Cloud:A Middleware Perspective" –– CRC Press-2012.
2. Dieter Uckelmann, Mark Harrison, "Architecting the Internet of Things", Springer-2011.
3. Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-On-Approach)", VPT, 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

References:

1. Luigi Atzori, Antonio Lera, Giacomo Morabito, "The Internet of Things: A Survey", Journal on Networks, Elsevier Publications, October, 2010.
2. http://www.theinternetofthings.eu/what-is-the-internet-of-things.

PCS5J103 SOFTWARE TESTING (4-0-0)

Module 1-Introduction

Testing as an Engineering Activity – Testing as a Process – Testing axioms – Basic definitions – Software Testing Principles – The Tester's Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design – Defect Examples – Developer/Tester Support of Developing a Defect Repository – Defect Prevention strategies.

Module 2-TEST CASE DESIGN

Test case Design Strategies – Using Black Bod Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Evaluating Test Adequacy Criteria.

Module 3-LEVELS OF TESTING

The need for Levers of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Website testing.

Module 4-TEST MANAGEMENT

People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – The role of three groups in Test Planning and Policy Development – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

Module 5-TEST AUTOMATION

Software test automation – skill needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
2. Naresh Chauhan, Software Testing Principle and Practices, Oxford University Press.
3. Ron Patton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2. Edward Kit," Software Testing in the Real World – Improving the Process", Pearson Education, 1995.
3. Boris Beizer," Software Testing Techniques" – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

PCS5J104 PARALLEL ALGORITHMS (4-0-0)

Module – I (10 Hrs)

Introduction: Need for High Performance Computer, Motivation for Parallelism, Methods to achieve High Performance, Parallel Programming Platforms- Control structure of parallel platform, Pipelining, Superscalar Architecture, Super Pipelined Architecture, VLIW Architecture, Pipelining vs. Parallelism.

Module – II (10Hrs)

Interconnection Networks for Parallel Computer: Static Interconnection Networks, Network Topologies, Evaluation of Static Network, Dynamic Interconnection Networks, Evaluation of Dynamic Network, Routing Mechanism for Interconnection Network.

Module – II (10 Hrs)

Designing Parallel Algorithms: Temporal Parallelism, Data Parallelism, Task Decomposition, Concurrency, Granularity selection, Inter-Task Dependency, Dependency Graph, Parallel Algorithm Models, Models of Computation, Performance Metrics of Parallel Algorithm, Amdahl's Law.

Module – II (10 Hrs)

Parallel Programming: Sorting, Searching, Matrix Multiplication, Data dependency and Loop Optimizations, Message Passing Programming, Shared Memory Programming, Data Parallel Programming, Performance evaluation of Parallel Computer.

Text Book

1. A. Grama, A. Gupta, G. Karypis, V. Kumar, Introduction to Parallel Computing, Pearson.
2. V. Rajaraman, C. S. R. Murthy, Parallel Computers Architecture and Programming, PHI.

References:

1. M. J. Quinn, Designing Efficient Algorithms for Parallel Computers, McGraw-Hill
2. W. P. Petersen, P. Arbenz, Introduction to Parallel Computing, Oxford University Press.
3. B. Wilkinson, M. Allen, Parallel Programming, Pearson.
4. H. Attiya, J. Welch, Distributed Computing Fundamentals, Simulations and Advanced Topics, Wiley.
5. T. G. Lewis, Parallel Programming: A Machine-Independent Approach, IEEE Computer Society Press.
6. M. R. Bhujade, Parallel Computing, New Age.

PCS5H001 CLOUD COMPUTING (4-0-0)

Module 1

Evolution of Computing Paradigms - Overview of Existing Hosting Platforms, Grid Computing, Utility Computing, Autonomic Computing, Dynamic Datacenter Alliance, Hosting / Outsourcing, Introduction to Cloud Computing, Workload Patterns for the Cloud, "Big Data", IT as a Service, Technology Behind Cloud Computing,

Module 2

A Classification of Cloud Implementations- Amazon Web Services - IaaS, The Elastic Compute Cloud (EC2), The Simple Storage Service (S3), The Simple Queuing Services (SQS), VMware vCloud - IaaS, vCloud Express, Google AppEngine - PaaS, The Java Runtime Environment,

Module 3

The Python Runtime Environment- The Datastore, Development Workflow, Windows Azure Platform - PaaS, Windows Azure, SQL Azure, Windows Azure AppFabric, Salesforce.com - SaaS / PaaS, Force.com, Force Database - the persistency layer, Data Security, Microsoft Office Live - SaaS, LiveMesh.com, Google Apps - SaaS, A Comparison of Cloud Computing Platforms, Common Building Blocks.

Module 4

Cloud Security – Infrastructure security – Data security – Identity and access management Privacy- Audit and Compliance.

Text Book:

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012

Reference Books

1. Barrie Sosinsky, "Cloud Computing Bible" John Wiley & Sons, 2010
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance", O'Reilly 2009

PCS5H004 INFORMATION RETRIEVAL (4-0-0)

Module1

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses. **Information Retrieval System Capabilities:** Search, Browse, Miscellaneous.**Cataloging and Indexing:** Objectives, Indexing Process, Automatic Indexing, Information Extraction.

Module2

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure. **Automatic Indexing:** Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages

Module3

Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy. of clusters. **User Search Techniques:** Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the Internet and hypertext.

Information Visualization: Introduction, Cognition and perception, Information visualization technologies.

Module4

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search systems. **Information System Evaluation:** Introduction, Measures used in system evaluation, Measurement example – TREC results.

TEXTBOOK:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Natural Language Processing and Information Retrieval, U. S. Tiwary & Tanveer Siddiqui, Oxford University Press

REFERENCES:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Modern Information Retrival By Yates Pearson Education.
3. Information Storage & Retieval By Robert Korfhage – John Wiley & Sons.

PCS5H002 DATA MINING AND DATA WAREHOUSING (4-0-0)

Module 1

The Compelling Need for data warehousing: Escalating Need for strategic information, failures of Past decision-support systems, operational versus decision-support systems, data warehousing – the only viable solution, data warehouse defined

Data warehouse – The building Blocks: Defining Features, data warehouses and data marts, overview of the components, metadata in the data warehouse

Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content.

Module 2

OLAP in the Data Warehouse:

Demand for Online analytical processing, need for multidimensional analysis, fast access and powerful calculations, limitations of other analysis methods, OLAP is the answer, OLAP definitions and rules, OLAP characteristics, major features and functions, general features, dimensional analysis, what are hypercube? Drill-down and roll-up, slice-and-dice or rotation, OLAP models, overview of variations, the MOLAP model, the ROLAP model, ROLAP versus MOLAP, OLAP implementation considerations

Module 3

Data Mining Basics: What is Data Mining, Data Mining Defined, The knowledge discovery process, OLAP versus data mining, data mining and the data warehouse, Major Data Mining Techniques, Cluster detection, decision trees, memory-based reasoning, link analysis, neural networks, genetic algorithms, moving into data mining, Data Mining Applications, Benefits of data mining, applications in retail industry, applications in telecommunications industry, applications in banking and finance

Module 4

Applications of Data mining-Social Impacts of Data mining-Tools- Mining the World Wide Web– Spatial Data Mining – Multimedia Data Mining – Text Mining. Programming assignments are mandatory.

Text Book:

1. Jiawei Han, Micheline Kamber, and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier.
2. Vikram Pudi & P. Radha Krishna, Data Mining, Oxford University Press.
3. Reema Thareja, Data Warehousing, Oxford University Press.

Reference Books:

1. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007
2. K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and
3. Practice”, Easter Economy Edition, Prentice Hall of India, 2006
4. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

Honors

PCS5D001 REAL TIME SYSTEMS (4-0-0)

MODULE-1 14Hrs

Introduction: What is real time, Applications of Real-Time systems, A basic model of Real-time system, Characteistics of Real-time system, Safety and Reliability, Types of Real-time tasks, timing constraints, Modelling timing constraints Real-Time Task Scheduling: Some important concepts, Types of Real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event-Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Some issues Associated with RMA. Issues in using RMA practical situations.

MODULE-2 14Hrs

Handling Resource Sharing and dependencies among Real-time Tasks: Resource sharing among real-time tasks. Priority inversion. Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP). Priority Ceiling Protocol (PCP). Different types of priority inversions under PCP. Important features of PCP. Some issues in using a resource sharing protocol. Handling task dependencies. Scheduling Real-time tasks in multiprocessor and distributed systems: Multiprocessor task allocation, Dynamic allocation of tasks. Fault tolerant scheduling of tasks. Clock in distributed Real-time systems, Centralized clock synchronization

MODULE-3 12Hrs

Commercial Real-time operating systems: Time services, Features of a Real-time operating system, Unix as a Real-time operating system, Unix-based Real-time operating systems, Windows as a Real-time operating system,POSIX-RT, A survey of contemporary Real-time operating systems. Benchmarking real-time systems.

Real-time Databases: Example applications of Real-time databases. Review of basic database concepts, Real-time databases, Characteristics of temporal data. Concurrency control in real-time databases. Commercial real-time databases. Realtime Communication: Basic concepts, Examples of applications, Real-time communication in a LAN and Real-time communication over packet switched networks.

Text Book:

1. Real-time Systems Theory and Practice by Rajib Mall, Pearson Publication, 2008.

References:

1. Jane W. S. Liu, Real-Time Systems, Pearson Education, 2000.
2. C.M. Krishna and K.G. Shin, Real-Time Systems, TMH.

Advanced Lab-I

1. Write a JAVA program to demonstrating multithreading.
2. Write a set of two JAVA programs for communicating between them using socket & datagram programming.
3. Write a JAVA Servlet Program to implement and demonstrate get() and Post methods(Using HTTP Servlet Class).
4. Write a JAVA JSP Program to implement verification of a particular user login and display a Welcome page.
5. Write a JDBC Program to insert data into Student DATA BASE and retrieve info based on particular queries(For example update, delete, search etc…).
6. Write a JSP program to read data from a DATABASE.
7. Write a set of JAVA programs to implement Remote method Invocation.
8. Develop a JAVA SWING program to design a calculator.
9. Using JSP develop a project to implement ONLINE EXAMINATION SYSTEM.

Sixth Semester								
	Theory					Practical		
Code	**Course Name**	**Hours/ Week L/T**	**Credit Theory**	**University Marks**	**Internal Evaluation**	**Hours/ Week L/T**	**Credit Practical**	**Marks**
PC	Computer Network & Data Communication	3-0	3	100	50	2	1	50
PC	Compiler Design	3-0	3	100	50	2	1	50
PE	Digital Image Processing/Digital Signal Processing/Natural language Processing/Wireless Sensor Networks	3-1	4	100	50			
PE	Internet & Web Technology/Pattern Recognition/Machine Learning/Advanced Operating System	3-1	4	100	50			
MC & GS	Environmental Science & Engineering	3-0	3	100	50			
OE	Industrial Lecture #					3	1	50
HS	Presentation Skill & Skill for Interview # #	2-0	1		50	4	2	100
MC	Yoga					2	1	50
Total		19	18	500	300	13	6	300
Total Marks: 1100								
Total Credits: 24								
Honours	Embedded System	4	4	100	50			
Minor	Computer Network and Data Communication							

Semester : 6th

1.	PCS6D001	Honours(CP)	Embedded Systems	4-0-0	4
2.	PCS6E101	HS(CP)	Business Communication & Skill for Interview	1-0-2	3
3.	PCS6G001	Minor(CP)	Computer Network and Data Communication	4-0-0	4
4.	PCS6H301	OE(CP)	Industrial Lecture #	0-0-1	1
5.	PCS6I101	PC(CP)	Computer Network and Data Communication	3-0-1	4
6.	PCS6I102	PC(CP)	Compiler Design	3-0-1	4
7.	PCS6J001	PE(O1)	Digital Image Processing	4-0-0	4
8.	PCS6J002	PE(O1)	Digital Signal Processing	4-0-0	4
9.	PCS6J003	PE(O1)	Neural language Processing	4-0-0	4
10.	PCS6J004	PE(O1)	Wireless Sensor Networks	4-0-0	4
11.	PCS6J005	PE(O2)	Internet & Web Technology	4-0-0	4
12.	PCS6J006	PE(O2)	Pattern Recognition	4-0-0	4
13.	PCS6J007	PE(O2)	Machine Learning	4-0-0	4
14.	PCS6J008	PE(O2)	Advanced Operating System	4-0-0	4

					28

To be conducted by the Training & Placement department by inviting experts from the industry. No academician to be called. Record may be asked by the University for verification. Evaluation to be done by the TPO.

To be conducted by the Training & Placement department of the College.

PCS6I101 COMPUTER NETWORK AND DATA COMMUNICATION

Module – I (12 Hrs)

Overview of Data Communication Networks, Protocols and standards, OSI Reference model, TCP/IP Protocol.

Physical Layer: Analog Signals, Digital Signals, Data Rate Limits, Transmission Impairment, Data rate limit, Digital Transmission: Digital-to-Digital conversion, Analog-to-Digital conversion, Transmission modes, Analog Transmission: Digital-to-Analog conversion, Analog-to-Analog conversion, Multiplexing: Frequency Division Multiplexing (FDM), Wave Division Multiplexing (WDM), Time Division Multiplexing (TDM), Transmission Media: Guided Media (Twisted-Pair Cable, Coaxial Cable and Fiber-Optic Cable) and unguided media (wireless), Switching: Circuit Switched Network, Datagram Network, Virtual-Circuit Network , Telephone Network, Dial-up Modems and Digital Subscriber Lines.

Module – II (10 Hrs)

Error Detection and correction: Types of Errors, Error Detection mechanism (Linear codes, CRC, Checksum), Error Correction mechanism: Hamming Encoding.

Data Link Control and Protocols: Flow and Error Control, Stop-and-Wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC and Point-to-Point Protocol

Multiple Access: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Polling, Reservation, Token Passing), Channelization (FDMA, TDMA, CDMA).

Wired LANs (Ethernet): Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.

Module – III (10 Hrs)

Wireless LANs: IEEE 802.11 and Bluetooth.

Connecting Devices: Passive Hub, Repeater, Active Hub, Bridge, Two layers Switch, Router, Three layers Switch, Gateway.

Virtual Circuit Networks: Frame Relay, Architecture & layers, ATM: Design goals, Architecture & layers.

Network Layer: IPV4 addresses, IPV6 addresses, Internet Protocol: Internetworking, IPV4 datagram, IPV6 packet format and advantages. Network Layer Protocols: ARP, RARP, IGMP and ICMP. Routing: Unicast Routing Protocols and Multicast Routing Protocols.

Transport Layer: Process to Process Delivery, User Datagram Protocol (UDP) and Transmission Control Protocol (TCP).

Module – IV (08Hrs)

Domain Name System (DNS): Name Space, Domain Name Space, DNS in Internet, Resolution and Dynamic Domain Name System (DDNS), Remote logging, Electronic Mail (SMTP) and file transfer (FTP), WWW: Architecture & Web document, HTTP: Transaction & Persistent vs. Nonpersistent connection.

Introduction to Wi-Fi and Li-Fi Technology.

Text Books:

1. Data Communications and Networking, Behrouz A. Forouzan, Tata McGraw-Hill.
2. Computer Networks, A. S. Tannenbum, D. Wetherall, Prentice Hall, Imprint of Pearson.
3. Data Communication and Networks, Bhushan Trivedi, Oxford University Press

Reference Book:

1. Network for Computer Scientists & Engineers, Zheng, Oxford University Press.
2. Computer Networks A system Approach, Larry L, Peterson and Bruce S. Davie, Elsevier.
3. Computer Networks, Natalia Olifer, Victor Olifer, Willey India.
4. Data and Computer Communications, William Stallings, Prentice Hall, Imprint of Pearson.

COMPUTER NETWORK LAB

1. Study of LAN Topology and various Network devices
2. IP address configuration and LAN setup
3. Build class A, B and C Network using router in Network tool
4. Implement Sub-netting concept using Network tool
5. Write a program to find out class of a given IP address, sub-netmask, first & last IP address of that subnet
6. Installation & Configuration of NS2 in Linux environment
7. Basic wired & wireless topology in NS2
8. Congestion Control: Stop & Wait, Sliding Window & Selective Repeat, Go Back N and Throughput analysis
9. IP Addressing, Static and Dynamic Routing
10. Write a program to build client-server model on different computers
11. Socket Programming, Network Management/ Monitoring Tools
12. DHCP, DNS, FTP Server configuration

PCS6I102 COMPILER DESIGN

Module – I (16 Hours)

Introduction: Overview and Phases of compilation.
Lexical Analysis: Non-Deterministic and Deterministic Finite Automata (NFA & DFA), Regular grammar, Regular expressions and Regular languages, Design of a Lexical Analyzer as a DFA, Lexical Analyzer generator.
Syntax Analysis: Role of a Parser, Context free grammars and Context free languages, Parse trees and derivations, Ambiguous grammar.
Top Down Parsing: Recursive descent parsing, LL (1) grammars, Non-recursive Predictive Parsing, Error reporting and Recovery.
Bottom Up Parsing: Handle pruning and shift reduces Parsing, SLR parsers and construction or SLR parsing tables, LR(1) parsers and construction of LR(1) parsing tables, LALR parsers and construction of efficient LALR parsing tables, Parsing using Ambiguous grammars, Error reporting and Recovery,Parser generator.

Module – II (08 Hours)

Intermediate Code Generation: DAG for expressions, Three address codes - Quadruples and Triples, Types and declarations, Translation of Expressions, Array references, Type checking and Conversions, Translation of Boolean expressions and control flow statements, Back Patching, Intermediate Code Generation for Procedures.

Module – III (08 Hours)

Code Generation: Factors involved, Registers allocation, Simple code generation using STACK Allocation, Basic blocks and flow graphs, Simple code generation using flow graphs.

Code Optimization: Objective, Peephole Optimization, Concepts of Elimination of local common sub-expressions, Redundant and un-reachable codes, Basics of flow of control optimization.

Module – IV (08 Hours)

Run Time Environment: Storage Organizations, Static and Dynamic Storage Allocations, STACK Allocation, Handlings of activation records for calling sequences.
Syntax Directed Translation: Syntax Directed Definitions (SDD), Inherited and Synthesized Attributes, Dependency graphs, Evaluation orders for SDD, Semantic rules, Application of Syntax Directed Translation.
Symbol Table: Structure and features of symbol tables, symbol attributes and scopes.

Text Books:

1. Compilers – Principles, Techniques and Tools, A. V. Aho, M. S. Lam, R. Sethi, J. D. Ullman, Pearson.
2. Compiler Design, K. Muneeswaran, Oxford University Press

Reference Books:

1. Compiler Design, S. Chattopadhyay, PHI.
2. Modern Compiler Design, D. Galles, Pearson Education.
3. Advanced Compiler Design & Implementation, S. S. Muchnick, Morgan Kaufmann.
4. Compiler Design in C, A. I. Holub, PHI

COMPILER DESIGN LABORATORY

This lab is divided in to two parts namely part 1 and part 2. All programs in part 1 must be written using C/C++. Programs related to lexical analyzer and parser must use Flex(Fast Lex) and Yacc available in all modern versions of UNIX and Linux distributions. For part 2, a simulator JFLAP is required to be installed. JFLAP works much like a black box and used to hide all implementation details and thus should only be used after students. JFLAP is available online at http://www.jflap.org/.

PART 1

1. Using JFLAP, create a DFA from a given regular expression. All types of error must be checked during the conversion.
2. Read a regular expression in standard form and check its validity by converting it to postfix form. Scan a string and check whether the string matches against the given regular expression or not.
3. (Tokenizing). A programs that reads a source code in C/C++ from an unformatted file and extract various types of tokens from it (e.g. keywords/variable names, operators, constant values).
4. Read a regular expression in its standard form and find out an Ɛ-NFA from it. Need to use adjacency list data structure of graph to store NFA. Thompson's construction needs to be used too. [2 labs]
5. Evaluate an arithmetic expression with parentheses, unary and binary operators using Flex and Yacc.[Need to write yylex() function and to be used with Lex and yacc.]
6. (Tokenizing) Use Lex and yacc to extract tokens from a given source code.

PART 2

7. Write a suitable data structure to store a Context Free Grammar. Prerequisite is to eliminate left recursion from the grammar before storing. Write functions to find FIRST and FOLLOW of all the variables.[May use unformatted file / array to store the result].
8. Using JFLAP create LL(1) parse table for a given CFG and hence Simulate LL(1) parsing.
9. Using JFLAP create SLR(1) parse table for a given grammar. Simulate parsing and output the parse tree proper format.

PCS6J001 DIGITAL IMAGE PROCESSING

Module-I (10 hours)

Digital Image Fundamentals: Introduction, Steps in Digital Image Processing, Components, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels, color models.
Enhancement in spatial domain: Gray level transformations, Histogram equalization and specification techniques, Enhancement using arithmetic/logic operations, Spatial filtering: smoothing and sharpening.

Module-II (10 hours)

Enhancement in frequency domain: Two dimensional Discrete Fourier transform and its inverse, filtering in frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homo-morphic filtering. **Image Restoration:** Noise models, Restoration in the presence of noise by spatial filtering, Periodic noise reduction by frequency domain filtering, estimating the degradation function, Inverse filtering, Wiener filtering, Geometric transformations.

Module- III (10 hours)

Morphological Image Processing: Operations involving binary images, Dilation, erosion, opening, closing, Hit-or-Miss Transformation, Basic morphological Algorithms-boundary extraction, region filling, extraction of connected components, thinning, thickening, pruning, dilation and erosion in gray scale images.

Module-IV (10 hours)

Image Compression: Need for Image compression, Image Compression models, Huffman coding, Arithmetic coding, LZW coding, Bit-plane coding, Transform coding, DCT, JPEG standard. Wavelets and Multi-resolution processing.
Additional Module: Introduction to Pattern Recognition and applications in current scenario.

Text book:

1. Rafael C. Gonzalez, Richard E.Woods,"Digital ImageProcessing",Pearson, SecondEdition, 2004.

Reference Books:

1. William K. Pratt, "Digital ImageProcessing",JohnWiley,New York,2002
2. AnilK.Jain,"FundamentalsofDigital ImageProcessing",Pearson2002
3. Rafael C.Gonzalez,RichardE.Woods,StevenEddins, "Digital ImageProcessing usingMATLAB",PearsonEducation,Inc.,2004

PCS6J002 DIGITAL SIGNAL PROCESSING

Module – I (08 Hrs)

Discrete Time System: Basic Discrete Time Signals and their classifications, Discrete times systems and their classifications, Stability of discrete time system, Analysis and response (convolution sum) of discrete - time linear LTI system, Recursive and Non-recursive discrete time system, impulse response of LTI system, Correlation of discrete time Signal.

Module –II (08 Hrs)

Z-Transform and Its Application to the Analysis of LTI Systems: Z-Transform, Direct Z-Transform, Properties of the Z- Transform, Inverse Z-Transform, Inversion Z-Transform by Power Series Expansion, Inversion of the Z-Transform by Partial-Fraction Expansion, Analysis of Linear Time-Invariant Systems in the z-Domain.

Module –III (12 Hrs)

Discrete Fourier Transform: Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals, Discrete Fourier Transform, DFT as a Linear Transformation, Relationship of DFT to other Transforms, Properties of DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution, Use of DFT in Linear Filtering, Filtering of Long Data Sequences.
Efficient Computation of DFT: FFT Algorithms, Direct Computation of the DFT, Radix-2 FFT Algorithms, Decimation-In-Time (DIT), Decimation-In-Time (DIF).

Module – IV (12 Hrs)

Structure and Implementation of FIR and IIR Filter: Structure for the Realization of Discrete-Time Systems, Structure of FIR Systems: Direct- Form Structure, Cascade-Form Structure, Frequency-Sampling Structure, Design of FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windows, Design of Linear-Phase FIR Filters by Frequency-Sampling Method. Structure for IIR Systems: Direct-Form Structure, Signal Flow Graphs and Transposed Structure, Cascade-Form Structure, Parallel-Form Structure. Design of IIR Filters from Analog Filters: IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation.
Basic adaptive filter: Structure of Adaptive FIR filter, System Modeling and Inverse Modeling,Matlab realization of DFT, FFT, Z-transform, IIR, FIR and adaptive filter.

Text Books:

1. Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, Pearson.
2. Digital Signal Processing: Tarun Kumar Rawat, Oxford University Press.

Reference Books:

1. Digital Signal Processing – S. Salivahan, A. Vallavraj and C. Gnanapriya, Tata McGrawHill.
2. Digital Signal Processing – Manson H. Hayes (Schaum's Outlines) Adapted by Subrata Bhattacharya, Tata McGraw Hill.
3. Digital Signal Processing - Dr. Shalia D. Apte, Willey Publication.

PCS6J003 NATURAL LANGUAGE PROCESSING (4-0-0)

MODULE – I : (8 HOURS)
Introduction to Natural Language Processing: Need for processing natural languages, issues and processing complexities in NLP, Brief history of NLP application development, Overview of phases of natural language processing; Language Modeling: Various types of languages and its modelling, Grammar based language models, Government and binding, Lexical functional grammar for handling natural languages, Statistical modelling, n gram model.

MODULE –II : (12 HOURS)
Word Level Analysis: Regular expressions, Finite state automata Morphological parsing, Human morphological parsing, Spelling error detection and correction, Words and word classes, Part of speech tagging, Rule-based tagger, Stochastic tagger, Unknown words. Syntactic Analysis: Context free grammar, Phrase and sentence level constructions, Parsing: Top-down parsing, Bottom-up parsing, A basic top-down parser, The Earley parser, The CYK Parser, Probabilistic parsing: Estimating rule probabilities, Parsing PCFGs, Problems with PCFG.

MODULE – III : (12 HOURS)
Semantic Analysis: Meaning representation, Characteristics of meaning representation languages, Meaning structure of languages, Syntax-driven semantic analysis, Semantic grammars, Lexical Semantics, Relations among lexemes and their senses, WordNet, Internal structure of words, Ambiguity, Word sense disambiguation, Selectional restriction-based disambiguation, Robust word sense disambiguation, Information retrieval, Other Information retrieval tasks

MODULE – IV : (12 HOURS)
Discourse Analysis: Context-based word sense disambiguation approaches, Knowledge sources in WSD, WSD evaluation discourse context and world knowledge: Local discourse context, Anaphora resolution, World Knowledge, Discourse structure, Psycholinguistic studies of reference and coherence, Natural Language Generation: Architecture of language generators, Surface realization, Discourse planning, Template-based, phrase-based and feature-based natural language generation, Knowledge-based approaches.

MODULE – V : (12 HOURS)
Machine Translation: Machine translation system, Issues, Language similarities and differences, The transfer metaphor, The interlingua idea: using meaning, Machine translation approaches: Direct machine translation, Rule-based machine translation: Transfer-based and interlingua based, Statistical and example-based machine translation, Semantic or knowledge based machine translation systems. Advanced Applications of NLP: Text to Speech system, Speech to Text system, Question Answering System, Text Summarization.

Text Books:
1. Speech and Language Processing – An introduction to language processing, computational linguistics, and speech recognition, D. Jurafsky and J. H. Martin, 2003, Pearson Education.
2. Natural language Processing and Information Retrieval, T. Siddiqui and U. S. Tiwary, 2008, Oxford University Press.

Reference Books:
1. Natural Language Understanding, J. Allen, 2nd edition, 2008, Pearson Education.
2. Natural Language Processing- A Pananian Perspective, A. Bharathi, V. Chaitanya and R. Sangal, 1995, PHI Learning.
3. Foundations of Statistical Natural Language Processing, Christopher D. Manning and Hinrich Schütze, 1999, MIT Press.

PCS6J004 WIRELESS SENSOR NETWORK

Module-1 (10 Hours)

Introduction: Definitions and Background, Challenges and Constraints, Applications. (Structural Health Monitoring, Habitat Monitoring, Smart Transportation, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining, Tracking Chemical Plumes).**Node Architecture**: The Sensing Subsystem, the Processor Subsystem, Communication Interfaces, Prototypes, Operating Systems: Functional Aspects, Nonfunctional Aspects, and Prototypes.

Module-2 (10 Hours)

Basic Architectural Framework: Physical Layer: Basic Components, Source and Channel Encoding, Modulation, Signal Propagation. Medium Access Control: Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols. **Network Layer**: Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols,

Module-3 (10 Hours)

Node and Network Management:Power Management: Local Power Management Aspects, Dynamic Power Management, Conceptual Architecture. Time Synchronization: Clocks and the Synchronization Problem, Time Synchronization in WSN, Basics of Time Synchronization, Time Synchronization Protocols. Localization: Ranging Techniques, Coarse-grained and Fine-grained node localization, Range-Based Localization, Range-Free Localization, Event-Driven Localization.

Module-4(10 Hours)

Security: Challenges of Security in WSN, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and Zig Bee Security. **Sensor Network Databases**: Sensor Database Challenges, Querying the physical environment, Query interfaces, High-level database organization, In-network Aggregation, Data Centric Storage, Distributed and Hierarchical Aggregation.Introduction to **Tiny OS and TOSSIM, OMNET, QUALNET** etc: Interfaces and Modules- Configurations and Wiring - Generic Components.

Text Books:

1. Fundamentals of Wireless Sensor Network: Theory and Practice: WaltenegusDargie and Christian Poellabauer, Wiley Publication, 2010.
2. Wireless Sensor Networks: An Information Processing Approach- by Feng Zhao, Leonidas Guibas , Morgan Kaufmann Series in Networking 2004

References Books:

1. Networking Wireless Sensors: BhaskarKrismachari, Cambridge University Press
2. Wireless Sensor Networks: Edited by C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati, Springer
3. Tiny OS Programming: Philip Levis and David Gay, Cambridge University Press, 2009.

PCS6J005 INTERNET AND WEB TECHNOLOGY

UNIT-I INTRODUCTION TO INTERNET

Introduction, Evolution of Internet, WEB2.0 and Evolution of WWW. Internet Protocol - TCP/IP, UDP, HTTP, Secure Http(https) Internet Addressing Scheme – Ipv4 & IPv6, Domain Name Server and IP Addresses-Mapping. Building Web Sites: Planning for designing Web pages, site navigation, model and structure of a Website, Web Servers, Web Browsers, Two Tier and Three Tier Web Based Architecture

UNIT-II HTML CSS AND SCRIPTING

HTML – Introduction, SGML, DTD(Document Type Definition). Basic HTML using images links, Lists, Tables and Forms, Frames for designing a good interactive website. HTML Standards, Issues in HTML

HTML5: Migration, New Elements, Semantics, Canvas, SVG, Google Maps, Multimedia, APIs

CSS: Syntax, Class Selector, Id Selector. External and Internal Style Sheets, Inline Style, and The class selector, div & span tags. Change the properties like background images, colors, and manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS.

CSS3: Rounded Corners, Border Images, Gradients, Shadows, 2D and 3D Transforms, Transitions, Animations, object-fit, Multiple Columns, Box Sizing, Flexbox.

Java Script – Java Script Object Model, Variables-Constant – Expressions, Conditions-Relational Operators- Data Types – Flow Control – Popup Boxes, Try…. Catch Statement, Throw Statement, and Objects of JavaScript: Date object, array object, Boolean object, math object Functions & Objects-events and event handlers – Data type Conversion & Equality – Accessing HTML form elements. Email and password validations.

UNIT-III XML and JAVA Applets

What is XML – Basic Standards, Schema Standards, Linking & Presentation Standards, Standards that build on XML, Generating XML data, Writing a simple XML File, Creating a Document type definition, Documents & Data ,Defining Attributes & Entities in the DTD ,Defining Parameter Entities & conditional Sections, Designing an XML data structure, XML Normalization.

Approaches to Dynamic Pages: CGI, Java Applets, Plug Ins, Active X controls, Java Applet: Introduction to Java, Writing Java Applets, Life cycle of applet, Design a login page using applets. Designing of applications using applet.

UNIT-IV INTERNET SECURITY & FIREWALLS

Security Threats From Mobile Codes, Types Of Viruses, Client Server Security Threats, Data & Message Security, Various electronic payment systems, Introduction to EDI, Challenges–Response System, Encrypted Documents And Emails , Firewalls: Hardened Firewall Hosts, Ip- Packet Screening, Proxy Application Gateways, Aaa (Authentication , Authorization And Accounting).

UNIT-V PHP

PHP: Starting to script on server side, Arrays, function and forms. Advance PHP: File Upload, Cookies, Sessions, Filters, Error Handling, Exception

Databases : Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

PCS6J006 PATTERN RECOGNITION (4-0-0)

MODULE I

Feature, Feature extraction and Pattern Representation, Concept of Supervised and Unsupervised Classification, Introduction to Application Areas.

Bayes Decision Theory : Discriminant Functions and Services, the Normal Distribution, Bayesian Classification, Estimating Probability Density Functions, Nearest Neighbor Rules, Bayesian Networks.

MODULE II

Classifier: the Perceptron Algorithm, Least-Squares Methods, Multilayer Perceptron's, Back Propagation Algorithm, Decision Trees ,Combinations of Classifiers, Support Vector Machines ,Radial Basis Function Networks

Feature Selection: Data Preprocessing,ROC Curves,Class Separability Measures,Feature Subset Selection,Bayesian Information Criterion

MODULE III

Feature Generation: The Karhunen-Loeve Transform, The Singular Value Decomposition, Independent Component Analysis, The Discrete Fourier Transform, The Hadamard Transform ,The Haar Transform.

Template Matching: Similarity Measures Based on Optimal Path Searching Techniques: Bellman's Optimality Principle and Dynamic Programming, The Edit Distance , Dynamic Time Warping in Speech Recognition, Measures Based on Correlations

MODULE IV

Unsupervised Classification:

Clustering :Sequential Algorithms, Hierarchical Clustering , Hard Clustering Algorithms : The Isodata or k-means or c-means Algorithm , k-Medoids Algorithms (The PAM, CLARA, CLARANS Algorithms)

Miscellaneous (Optional):

Graph Clustering, Learning Clustering, Clustering High Dimensional Data-Subspace Clustering, Ensemble learning algorithms, Markov random fields, Kalmanfilters,and Particle filters.

Text Book:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley

Reference Books:

1. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006
2. Theodoridis, S. and K. Koutroumbas, Pattern recognition. 4th ed. 2009, San Diego, CA: Academic Press.

PCS6J007 MACHINE LEARNING

Module I:

Introduction: well-posed learning problems, designing a learning system, perspectives and issues in machine learning, concept learning and the general-to-specific ordering: Introduction, Concept learning task, concept learning as search, Find-S: finding a maximally specific hypothesis, version spaces and the candidate-elimination algorithm, remarks on version spaces and candidate-elimination, inductive bias. Decision tree learning: Introduction, Decision tree representation, appropriate problems for decision tree learning, the basic decision tree algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

Module II:

Artificial Neural Networks: Introduction, Biological motivation, ANN representation, appropriate problem for ANN learning, Perceptron, multilayer networks and the backpropagation algorithm, remarks on the backpropagation algorithm, Linear Models for Regression, Support Vector Machine, Kernel function and Kernel SVM.

Module-III:

Probability and Bayesian learning: Introduction, Bayes Theorem, Bayes theorem and concept Learning, maximum likelihood and least-squared error hypotheses, Bayes optimal classifier, Gibbs Algorithm, Naïve Bayes Classifier, example to illustrate Naïve Bayes classifier. Instance-Based Learning: Introduction, K-Nearest Neighbor Learning, Radial Basis Functions.

Module-IV:

Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model, theCurse of Dimensionality - Dimensionality Reduction - Factor analysis - Principal Component Analysis

TEXT BOOK

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.

REFERENCE BOOKS

1. Introduction to Machine Learning Edition 2, by EthemAlpaydin
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.

PCS6J008 ADVANCED OPERATING SYSTEM

Module 1:
Introduction to UNIX/Linux Kernel : System Structure, User Perspective, Assumptions about Hardware, Architecture of UNIX Operating System (TextBook-3: Chapter Topics: 1.2, 1.3,1.5, 2.1), Concepts of Linux Programming, Getting Started with SystemProgramming (TextBook-1: Chapter 1-Relevant Topics), Introduction to the tools on Linux (Chapter 3 Text Book 5),NASM (Chapter 3,4,7,8Book 6)

Module 2:
File and Directory I/O : inodes, structure of regular file, open, read, write, lseek, close, pipes, dup (TextBook-3: Chapter Topics: 4.1, 4.2, 5.1-5.6), open, creat, close, lseek, read, write, file sharing, atomic operations, dup and dup2, fcntl, ioctl, /dev/fd, stat, fstat, lstat, file types,Set-User-ID and Set-Group-ID, file access permissions, ownership of new files and directories, access function, umaskfunction, chmod and fchmod, sticky bit, chown, fchown, and lchown, file size, file truncation, file systems, link, unlink, remove, and rename functions, symbolic links, symlink and readlink functions, file times, utime, mkdirand rmdir, readingdirectories, chdir, fchdir, and getcwd, device special files (TextBook-4: Chapter Topics: 3.3-3.16, 4.2-4.23), Scatter/Gather I/O, The Event Poll Interface, Mapping Files into Memory, Advice for Normal File I/O, Synchronized, Synchronous, and Asynchronous Operations, I/O Schedulers and I/O Performance, Files and their Metadata , Directories, Links,Copying and Moving files, Device Nodes, Out-of-Band Communication, Monitoring File Events (TextBook-1: Chapters: 4 and 7)

Module 3:
Process Environment, Process Control and Process Relationships: Process states and transitions, the context of a process, saving the context of a process, sleep, process creation, signals, process termination, awaiting process termination, invoking other programs, the user id of a process (TextBook-3: Chapter Topics: 6.1, 6.3, 6.4, 6.6, 7.1-7.6), Process termination, environment list, memory layout of aC program, shared libraries, memory allocation, environment variables, setjmp and longjmp, getrlimit and setrlimit, process identifiers, fork, vfork, exit, wait and waitpid, waitid, wait3 andwait4, race conditions, exec, changing user IDs and group IDs, interpreter files, system function, process accounting, user identification, process times, Terminal logins, network logins, process groups, sessions, controlling terminal, tcgetpgrp, tcsetpgrp, and tcgetsid functions, job control, shell execution of programs, orphanedprocess groups (TextBook-4: Chapter Topics: 7.3-7.11, 8.2-8.16, 9.2-9.10) , The Process ID, Running a New Process, Terminating a Process, Waiting for Terminated Child Processes, Users and Groups, Sessions and Process Groups, Daemons, Process Scheduling, Yielding the Processor, Process Priorities, Processor Affinity (TextBook-1: Chapter 5 and 6 [Relevant Topics])

Module 4:
Memory Management: The Process Address Space, Allocating Dynamic Memory, Managing Data Segment,Anonymous Memory Mappings, Advanced Memory Allocation, Debugging MemoryAllocations, Stack-Based Allocations, Choosing a Memory Allocation Mechanism, Manipulating Memory, Locking Memory, Opportunistic Allocation(TextBook-1: Chapter 8),

Module 5:

Signal Handling: Signal concepts, signal function, unreliable signals, interrupted system calls, reentrant functions, SIGCLD semantics, reliable-signal technology, kill and raise, alarm and pause, signal sets, igprocmask, sigpending, sigaction, sigsetjmp and siglongjmp,sigsuspend, abort, system function revisited, sleep, job-control signals (TextBook-4: Topics: 10.2-10.20), Signal Concepts, Basic Signal Management, Sending a Signal, Reentrancy, Signal Sets, Blocking Signals, Advanced Signal Management, Sending a Signal with a Payload (TextBook-1: Chapter 9).

Recommended Text:

1. Linux System Programming, O'Reilly, by Robert Love. (Chapter 1 and 4-9 [Relevant Topics])
2. Windows Internals, Microsoft Press, by Mark E. Russinovich and David A. Soloman. Chapter References: (Chapter 1, 2, and 5 [Relevant Topics])
3. The Design of the UNIX Operating System, PHI, by Maurice J. Bach. Chapter References: (1.2, 1.3, 1.5, 2.1, 4.1, 4.2, 5.1-5.6, 6.1
4. , 6.3, 6.4, 6.6, 7.1-7.6)
5. Advanced Programming in the UNIX Environment, Addison-Wesley, by Richard Stevens.Chapter References: (3.3-3.16, 4.2-4.23, 7.3-7.11, 8.2-8.16, 9.2-9.10,10.2-10.20)
6. Guide to Assembly Language Programming in Linux, Sivarama P. Dandamudi, Springer
7. Professional Assembly Language, Richard Blum, Wrox, Wiley India

PMG6M001 ENVIRONMENTAL SCIENCE AND ENGINEERING

Module I

Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Natural Resources:

Renewable and non-renewable resources:

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resoureces for sustainable lifestyles.

Module II

Ecosystems

Concept of an ecosystem.

- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-

a) Forest ecosystem

b) Grassland ecosystem

c) Desert ecosystem

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Environmental Pollution Definition

- Cause, effects and control measures of :-

a) Air pollution

b) Water pollution

c) Soil pollution

d) Marine pollution

e) Noise pollution

f) Thermal pollution

g) Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.

- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.

Module III

Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rahabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Module IV

Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

References

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. R. Rajagopalan, Environmental Studies, Oxford University Press
3. Ajith Sankar, Environmental Mangement, Oxford University Press
4. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
5. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
6. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
7. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
8. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
9. Down to Earth, Centre for Science and Environment (R)

PEN6E101 BUSINESS COMMUNICATION AND SKILL FOR INTERVIEW

Course Objectives

- To develop communication competence in prospective engineers.
- To enable them to convey thoughts and ideas with clarity and focus.
- To develop report writing skills.
- To equip them to face interview & Group Discussion.
- To inculcate critical thinking process.
- To prepare them on problem solving skills.
- To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
- To understand team dynamics & effectiveness.
- To create an awareness on Engineering Ethics and Human Values.
- To install Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
- To learn leadership qualities and practice them.

MODULE I

Communication Skill: Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication.

MODULE II

Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats, Mind Mapping & Analytical Thinking.

Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.

MODULE III

Ethics, Moral & Professional Values: Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.

MODULE IV

Leadership Skills: Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation.

Expected outcome:

The students will be able to

- Communicate effectively.
- Make effective presentations.
- Write different types of reports.
- Face interview & group discussion.
- Critically think on a particular problem.
- Solve problems.
- Work in Group & Teams
- Handle Engineering Ethics and Human Values.

- Become an effective leader.

References:

1. Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxford Publishers.
2. Kalyana; (2015) "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd.
3. Larry James (2016); "The First Book of Life Skills"; First Edition; Embassy Books.
4. Shalini Verma (2014); "Development of Life Skills and Professional Practice"; First
   Edition; Sultan Chand (G/L) & Company
5. John C. Maxwell (2014); "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc.

PCS6D001 EMBEDDED SYSTEM (HONOURS)

Module I (12 hrs)

Hardware Concepts

Embedded System, Application and characteristics of embedded systems, Overview of Processors and hardware units in embedded system, embedded software in a system, Examples of Embedded system.

ARM

ARM pipeline, Instruction Set Architecture ISA: Registers, Data Processing Instructions, Data
Transfer Instructions, Multiplications instructions, Software interrupt, Conditional execution, branch instruction, Swap instruction, THUMB instructions.

Module II (8hrs)

Devices and device drivers: I/O devices, Serial peripheral interfaces,IIC, RS232C, RS422,
RS485, Universal serial bus, USB Interface, USB Connector IrDA, CAN, Bluetooth, ISA,
PCI, PCI -X and advance busses, Device drivers.

Module –III (8 hrs)

Real Time Operating System(RTOS): Real-Time Task Scheduling: Some important concepts, Types of real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event-Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA)

Module –IV (8 hrs)

Modelling Techniques: Software and programming concept: Processor selection for an embedded system, State chart, SDL, Petri-Nets, Unified Modeling Language (UML). Hardware software co-design. Hardware and software partitioning: K-L partitioning, Partitioning using genetic algorithm,

Module –V (8 hours)

Low power embedded system design: Dynamic power dissipation, Static power dissipation, Power reduction techniques, system level power management. Software design for low power devices.

Text Books:

1. "Embedded system architecture, programming and design" By Raj Kamal, TMH.
2. "Embedded System Design " by SantanuChattopadhay, PHI
3. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware /Software Introduction, John Wiley, 2002.

Reference Books:

1. "Hardware software co-design of Embedded systems" By Ralf Niemann, Kulwer Academic.
2. "Embedded real time system programming" By Sriram V Iyer, Pankaj Gupta, TMH.

PCS6G001 COMPUTER NETWORK AND DATA COMMUNICATION (MINOR)

Module – I (12 Hrs)

Overview of Data Communication Networks, Protocols and standards, OSI Reference model, TCP/IP Protocol.

Physical Layer: Analog Signals, Digital Signals, Data Rate Limits, Transmission Impairment, Data rate limit, Digital Transmission: Digital-to-Digital conversion, Analog-to-Digital conversion, Transmission modes, Analog Transmission: Digital-to-Analog conversion, Analog-to-Analog conversion, Multiplexing: Frequency Division Multiplexing (FDM), Wave Division Multiplexing (WDM), Time Division Multiplexing (TDM), Transmission Media: Guided Media (Twisted-Pair Cable, Coaxial Cable and Fiber-Optic Cable) and unguided media (wireless), Switching: Circuit Switched Network, Datagram Network, Virtual-Circuit Network , Telephone Network, Dial-up Modems and Digital Subscriber Lines.

Module – II (10 Hrs)

Error Detection and correction: Types of Errors, Error Detection mechanism (Linear codes, CRC, Checksum), Error Correction mechanism: Hamming Encoding.

Data Link Control and Protocols: Flow and Error Control, Stop-and-Wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC and Point-to-Point Protocol

Multiple Access: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Polling, Reservation, Token Passing), Channelization (FDMA, TDMA, CDMA).

Wired LANs (Ethernet): Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.

Module – III (10 Hrs)

Wireless LANs: IEEE 802.11 and Bluetooth.

Connecting Devices: Passive Hub, Repeater, Active Hub, Bridge, Two layers Switch, Router, Three layers Switch, Gateway.

Virtual Circuit Networks: Frame Relay, Architecture & layers, ATM: Design goals, Architecture & layers.

Network Layer: IPV4 addresses, IPV6 addresses, Internet Protocol: Internetworking, IPV4 datagram, IPV6 packet format and advantages. Network Layer Protocols: ARP, RARP, IGMP and ICMP. Routing: Unicast Routing Protocols and Multicast Routing Protocols.

Transport Layer: Process to Process Delivery, User Datagram Protocol (UDP) and Transmission Control Protocol (TCP).

Module – IV (08Hrs)

Domain Name System (DNS): Name Space, Domain Name Space, DNS in Internet, Resolution and Dynamic Domain Name System (DDNS), Remote logging, Electronic Mail (SMTP) and file transfer (FTP), WWW: Architecture & Web document, HTTP: Transaction & Persistent vs. Nonpersistent connection.

Introduction to Wi-Fi and Li-Fi Technology.

Text Books:

4. Data Communications and Networking, Behrouz A. Forouzan, Tata McGraw-Hill.
5. Computer Networks, A. S. Tannenbum, D. Wetherall, Prentice Hall, Imprint of Pearson.
6. Data Communication and Networks, Bhushan Trivedi, Oxford University Press

Reference Book:

5. Network for Computer Scientists & Engineers, Zheng, Oxford University Press.
6. Computer Networks A system Approach, Larry L, Peterson and Bruce S. Davie, Elsevier.
7. Computer Networks, Natalia Olifer, Victor Olifer, Willey India.
8. Data and Computer Communications, William Stallings, Prentice Hall, Imprint of Pearson.

Final Year Engineering

Semester : 7th

Sl. No.	Subject Code	Category	Subject Name	L-T-P	Credit
1.	PCS7C001	GS(CP)	Nano & Bioscience	4-0-0	4
2.	PCS7D001	Honours(CP)	Computational Number Theory	4-0-0	4
3.	PCS7H001	OE(O4)	Soft Computing	4-0-0	4
4.	PCS7H002	OE(O4)	Other subjects	4-0-0	4
5.	PCS7H201	FE(CP)	Projects on Internet of Things	0-0-4	4
6.	PCS7I201	PC(O3)	Advance Lab - II	0-0-4	4
7.	PCS7I202	PC(O3)	Project	0-0-4	4
8.	PCS7J001	PE(O1)	Cryptography & Network Security	4-0-0	4
9.	PCS7J002	PE(O1)	Robotics	4-0-0	4
10.	PCS7J003	PE(O1)	VLSI Design	4-0-0	4
11.	PCS7J004	PE(O1)	Social Networks	4-0-0	4
12.	PCS7J005	PE(O2)	Mobile Computing	4-0-0	4
13.	PCS7J006	PE(O2)	Software Project Management	4-0-0	4
14.	PCS7J007	PE(O2)	Algorithm for Bioinformatics	4-0-0	4
15.	PCS7J008	PE(O2)	Expert Systems	4-0-0	4
					28

*Student can choose from any department but subject must be running in that semester.

PCS7H001 SOFT COMPUTING

MODULE – I (8 hours)

Basic tools of soft Computing: Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non – linear Error surface and optimization.

MODULE – II (8 hours)

Fuzzy Logic Systems: Basics of fuzzy logic theory, Crisp and fuzzy sets; Basic set operations; Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference; Defuzzificaiton ; Fuzzy logic control; Mamdani and Takagi and Sugeno architectures. Applications to pattern recognition.

MODULE—III (16 hrs)

Neural networks: Single layer networks, Perceptron; Activation functions; Adalinc- its training and capabilities, weights learning, Multilayer perceptrons; error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm, Kohenen self – organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information; systems (ANFIS),

MODULE—IV (08 hrs)

Evolutionary Computing: Genetic algorithms: Basic concepts, encoding, fitness function, reproduction. Differences of GA and traditional optimization methods. Basic genetic, basic evolutionary programming concepts Applications, hybrid evolutionary algorithms.

ADDITIONAL MODULE (Terminal Examination-Internal)

Applications to Different Engineering problems.

Text Books

1) *F. O. Karry and C. de Silva, "Soft Computing and Intelligent Systems Design – Theory, Tools and Applications". Pearson Education. (Printed in India).*

Reference Books

1) J. S. R. Jang. C. T. SUN and E. Mizutani, "Neuro-fuzzy and soft-computing". PHI Pvt. Ltd., New Delhi.

2) Fredric M. Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGraw Hill.

3) S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India.

4) V. Keeman, "Learning and Soft computing", Pearson Education, India.

5) R. C. Eberhart and Y. Shi, "Computational Intelligence Concepts to Implementation". Morgan Kaufmann Publishers (Indian Reprint).

PCS7J005 MOBILE COMPUTING

Module - I (10 Hours)

Introduction to Personal Communications Services (PCS): PCS Architecture, mobility management, Networks signalling, Global System for Mobile Communication (GSM) System overview: GSM Architecture, Mobility management, Network signalling. General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; WLANs (Wireless LANs) IEEE 802.II standard, Mobile
IP.

Module - II (12 Hours)

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark-up Languages (WML), Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000

Module - III (10 Hours)

Global Mobile Satellite Systems; case studies of the IRIDIUM, ICO and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Server-side programming in Java, Pervasive web application architecture, Device independent example application.

Module - IV (08 Hours)

Mobile Device Operating System, Commercial mobile operating systems, Software development kit, iOS, Android, Windows phones, M-Commerce, Mobile transaction system, related security issues, 4G technology, fundamental concepts of mobile cloud computing and different application instances.

Text Books:

1. P.K. Patra, S.K. Dash: **Mobile Computing**, Scitech Publications.
2. Rajkamal: **Mobile Computing**, Oxford University Press.
3. J. Schiller: **Mobile Communication**, Pearson Education

Reference Books:

1. Burkhardt: **Pervasive Computing**, Pearson Education.
2. Hansmann, Merk: **Principles of Mobile Computing**, 2nd Edition, Springer.
3. P. Stavronlakis: **Third Generation Mobile Telecommunication Systems**, Springer.
4. Sandeep Singhal: **The Wireless Application Protocol**, Pearson Education.