Computer Science and Engineering (CS)

EN010301 B Engineering Mathematics II

(CS, IT)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives

- *To know the importance of learning theories and strategies in Mathematics and graphs.*

MODULE 1 Mathematical logic (12 hours)

Basic concept of statement , logical connectives, Tautology and logical equivalence – Laws of algebra of propositions – equivalence formulas – Tautological implications (proof not expected for the above laws , formulas and implications). Theory of inference for statements – Predicate calculus – quantifiers – valid formulas and equivalences – free and bound variables – inference theory of predicate calculus

MODULE 2 Number theory and functions (12 hours)

Fundamental concepts – Divisibility – Prime numbers- relatively prime numbers – fundamental theorem of arithmetic – g.c.d - Euclidean algorithm - properties of gcd (no proof) – l c m – Modular Arithmetic – congruence – properties – congruence class modulo n – Fermat's theorem – Euler's Totient functions - Euler's theorem - Discrete logarithm

Function – types of functions – composite functions – inverse of a function – pigeon hole principles

MODULE 3 Relations (10 hours)

Relations – binary relation – types of relations – equivalence relation –partition – equivalence classes – partial ordering relation – Hasse diagram - poset

MODULE 4 Lattice (14 hours)

Lattice as a poset – some properties of lattice (no proof) – Algebraic system – general properties – lattice as algebraic system – sublattices – complete lattice – Bounded Lattice - complemented Lattice – distributive lattice – homomorphism - direct product

MODULE 5 Graph Theory (12 hours)

Basic concept of graph – simple graph – multigraph – directed graph- Basic theorems (no proof) . Definition of complete graph , regular graph, Bipartite graph, weighted graph – subgraph – Isomorphic graph –path – cycles – connected graph.- Basic concept of Eulergraph and Hamiltonian circuit – trees – properties of tree (no proof) - length of tree – spanning three – sub tree – Minimal spanning tree (Basic ideas only . Proof not excepted for theorems)

References

1. S.Lipschutz, M.L.Lipson – Discrete mathematics –Schaum's outlines – Mc Graw Hill
2. B.Satyanarayana and K.S. Prasad – Discrete mathematics & graph theory – PHI
3. Kenneth H Rosen - Discrete mathematics & its Application - Mc Graw Hill
4. H. Mittal , V.K.Goyal, D.K. Goyal – Text book of Discrete Mathematics - I.K. International Publication
5. T. Veerarajan - Discrete mathematics with graph theory and combinatorics - Mc Graw Hill
6. C.L.Lieu - Elements of Discrete Mathematics - Mc Graw Hill
7. J.P.Trembly,R.Manohar - Discrete mathematical structures with application to computer science - Mc Graw Hill
8. B.Kolman , R.C.Bushy, S.C.Ross - Discrete mathematical structures- PHI
9. R.Johnsonbough - Discrete mathematics – Pearson Edn Asia

EN010 302 Economics and Communication Skills

(Common to all branches)

Teaching scheme

2hours lecture and 2 hours tutorial per week **Credits: 4(3+1)**

Objectives

- To impart a sound knowledge of the fundamentals of Economics.

Economics

Module I (7 hours)

Reserve Bank of India-functions-credit control-quantitative and qualitative techniques
Commercial banks-functions- Role of Small Industries Development Bank of India and National Bank for Agriculture and Rural Development
The stock market-functions-problems faced by the stock market in India-mutual funds

Module II (6 hours)

Multinational corporations in India-impact of MNC's in the Indian economy
Globalisation-necessity-consequences
Privatisation-reasons-disinvestment of public sector undertakings
The information technology industry in India-future prospects

Module III (6 hours)

Direct and indirect taxes- impact and incidence- merits of direct and indirect taxes-progressive and regressive taxes-canons of taxation-functions of tax system-
tax evasion-reasons for tax evasion in India-consequences-steps to control tax evasion
Deficit financing-role-problems associated with deficit financing

Module IV (5 hours)

National income-concepts-GNP, NNP, NI, PI and DPI-methods of estimating national income-difficulties in estimating national income
Inflation-demand pull and cost push-effects of inflation-government measures to control inflation

Module V (6 hours)

International trade-case for free trade-case for protectionism
Balance of payments-causes of disequilibrium in India's BOP-General Agreement on Tariffs and Trade-effect of TRIPS and TRIMS in the Indian economy-impact of WTO decisions on Indian industry

Text Books

1. Ruddar Datt, Indian Economy, S.Chand and Company Ltd.
2. K.K.Dewett, Modern Economic Theory, S.Chand and Company Ltd.

References

1. Paul Samuelson, Economics, Tata McGraw Hill
2. Terence Byres, The Indian Economy, Oxford University Press
3. S.K.Ray, The Indian economy, Prentice Hall of India
4. Campbell McConnel, Economics, Tata McGraw Hill

Communication Skills

Objectives

- To improve Language Proficiency of the Engineering students
- To enable them to express themselves fluently and appropriately in social and professional contexts
- To equip them with the components of different forms of writing

MODULE – 1 (15 hours)

INTRODUCTION TO COMMUNICATION

Communication nature and process, Types of communication - Verbal and Non verbal, Communication Flow-Upward, Downward and Horizontal, Importance of communication skills in society, Listening skills, Reading comprehension, Presentation Techniques, Group Discussion, Interview skills, Soft skills

MODULE – II (15 hours)

TECHNICAL COMMUNICATION

Technical writing skills- Vocabulary enhancement-synonyms, Word Formation-suffix, affix, prefix, Business letters, Emails, Job Application, Curriculum Vitae, Report writing-Types of reports

Note: No university examination for communication skills. There will be internal evaluation for 1 credit.

REFERENCES

1. The functional aspects of communication skills, P.Prasad and Rajendra K. Sharma, S.K. Kataria and sons, 2007
2. Communication skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning private limited, 2010
3. Professional Communication, Kumkum Bhardwaj, I.K. International (P) House limited, 2008
4. English for technical Communication, Aysha Viswamohan, Tata Mc Graw Publishing company limited, 2008

CS010 303: Problem Solving and Computer Programming

(Common with IT010 306)

Teaching scheme **Credits:** 4

2 hours lecture and 2 hour tutorial per week

Objectives

- *To impart the basic concepts of problem solving using a computer.*
- *To learn about the structure of C programming language.*

Module I (10 hours)

Problem solving: Steps in Computer programming – Features of a good program – Problem solving using Algorithms and Flowcharts.

C fundamentals: Character set, Constants, Identifiers, keywords, basic data types, Variables, Operators, Expressions, Statements, Input and Output statements – Structure of a C program – simple programs.

Module II (13 hours)

Control statements: if, if-else, nested if – switch – while – do-while – for – break & continue – nested loops.

Single dimensional arrays – defining an array, array initialisation, accessing array elements – Programs for sequential search, bubble sort, binary search.

Multidimensional arrays – defining a two dimensional array, array initialisation, accessing elements – Programs for matrix processing.

Module III (12 hours)

Strings: declaring a string variable, reading and displaying strings, string related library functions – Programs for string matching and sorting.

Functions: Function definition, function call, function prototype, parameter passing, void function – Recursion – Passing array to function.

Macros: Defining and calling macros – Difference between macro & function.

Module IV (13 hours)

Structures: defining a structure variable, accessing members, array of structures, passing structure to function.

Unions: difference with structure, defining union variable, accessing members.

Pointers: declaration, operations on pointers, passing pointer to a function, accessing array elements using pointers, processing strings using pointers, pointer to pointer, array of pointers, pointer to array, pointer to function, pointer to structure, self referential structure.

Module V (12 hours)

Files: Different types of files in C – Opening & Closing a file – Writing to and Reading from a file – Processing files – Library functions related to file – fseek(), ftell(), ungetc(), fread(), fwrite() – Dynamic memory allocation.

Storage Class associated with variables: automatic, static, external and register.

Additional features: Enumerated data type, bitwise operators, typedef.

References

1. Programming with C - Byron S. Gottfried, Tata McGraw Hill.
2. Computer Programming in C - Kerninghan & Ritchie, PHI .
3. Programming in C - Stephen C. Kochan, CBS publishers.
4. Programming in C (5e) – E. Balaguruswamy , Mc Graw Hill
5. Let us C – Yashwant Kanetkar, BPB.
6. A Book on C – Al Kelley and Ira Pohl, Addison-Wesley

7. Mastering Turbo C - Stan Kelly Bootle, BPB Publications.
8. Programming and Problem Solving with PASCAL - Micheal Schneider, Wiley Eastern Ltd. (Module 1)
9. Pointers in C - Yashwant Kanetkar, BPB
10. The Spirit of C- by Munish cooper, Jaico Books.

CS010 304: Computer Organization

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To develop a good understanding of a complete computer system through an integrated approach to hardware, software and processor design.*
- *To emphasise on both background theory and actual design.*

Module I (10 hours)

CPU - Arithmetic: Signed addition and subtraction –BCD adder –Multiplication – Array multiplier – Booth's Algorithm, Division – Restoring and non-restoring division.

Module II (12 hours)

Floating-point arithmetic- addition, subtraction, multiplication, division. Decimal arithmetic- addition subtraction, multiplication, division. ALU - design of arithmetic, logical, arithmetic logical unit

Module III (14 hours)

Control Logic Design – Control Organization – Hardware control, Microprogram control (design for specific problems)– Microprogram sequencer, Horizontal and vertical micro instructions.

Module IV (12 hours)

Memory: - Memory hierarchy –Principle of inclusion-memory interleaving techniques. Disk memory - Data organisation on disk-Disk performance –Disk caching. Main memory-SRAM, DRAM, ROM –Associative memory, Scratchpad memory-Cache memory –Levels of Cache-Mapping techniques, Associative, Direct, and Set Associative-Main memory update policies.

Module V (12 hours)

Virtual Memory:-Overlay-Need for virtual memory-Address translation-Translation Look Aside Buffer-Relocation techniques-static, dynamic-Paged memory-Page table, Page frame data table-Segmented memory-Paged segments.

Reference Books

1. M.Morris Mano- *Computer System Architecture*- PHI- Third Edition-2006
2. M.Morris Mano – *Digital Logic and Computer Design* - PHI -2004
3. Carl Hamacher, Zvonko Vranesic, Safwat –*Computer Organization*-McGrawHill-Fifth Edition
4. David A.Patterson,John L.Hennessy-*Computer Organization and Design*-MK-Arm Edition
5. V.Carl Hamacher,Zvonko G. vranesic,Safwat G.Zaky-*Computer Organization*-McGrawHill-Fourth Edition
6. Behrooz parhami-*Computer Architecture*-Oxford University Press
7. Naresh Jotwani-*Computer System Organisation*- McGrawHill

Mahatma Gandhi University

CS010 305 SWITCHING THEORY AND LOGIC DESIGN

(Common with IT010 304)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives:-

To introduce the principles of Logic Systems and Circuits, thereby enabling the student to obtain the platform for studying Computer Architecture and Design.

Module 1: (14 Hrs)

Number Systems and Codes:- Decimal, Binary, Octal and Hexadecimal Number systems, Codes- BCD, Gray Code, Excess-3 Code, ASCII, EBCDIC, Conversion between various Codes.

Switching Theory:- Boolean Algebra- Postulates and Theorems, De' Morgan's Theorem, Switching Functions- Canonical Forms- Simplification of Switching Functions- Karnaugh Map and Quine Mc-Clusky Methods.

Module 2: (12 Hrs)

Combinational Logic Circuits:- Review of Basic Gates- Universal Gates,Adders, Subtractors, Serial Adder, Parallel Adder- Carry Propagate Adder, Carry Lookahead Adder, Carry Save Adder, Comparators, Parity Generators, Decoder and Encoder, Multiplexer and Demultiplexer, PLA and PAL.

Module 3(12 Hrs)

Sequential Logic Circuits:- Latches and Flip Flops- SR, JK, D, T and MS Flip Flops, Asynchronous Inputs.

Clocked Sequential Circuits:- State Tables State Equations and State Diagrams, State Reduction and State Assignment, Design of Clocked Sequential Circuits using State Equations.

Module 4: (10 Hrs)

Counters and Shift Registers:- Design of Synchronous and Asynchronous Counters:- Binary, BCD, Decade and Up/Down Counters , Shift Registers, Types of Shift Registers, Counters using Shift Registers- Ring Counter and Johnson Counter.

Module 5(12 Hrs)

Fault Tolerance and Diagnosis : Concepts of Fault and Hazards- Fault Tolerance in Combinational Circuits- Fault Table, Fault Detection methods-Boolean Difference and Path Sensitizing Methods-

Digital ICs- Digital Logic Families- Characteristics- Introduction to RTL, TTL,ECL, MOS and CMOS Logics.

Reference Books

1. Zvi Kohavi *Switching and Finite Automat theory*, Tata McGrwHill
2. Morris Mano *Digital Logic and Computer Design* ,Prentice Hall of India
3. Floyd T.L. *Digital Fundamentals* , Universal Bookstall
4. Biswas N.N. *Logic System Theory* Prentice Hall of Inia
5. Leach D. Malvino A.P. & Saha – *Digital Principles and Applications*- Tata McGraw Hill
6. Tau b ,Helbert abd Schilling, *Digital Integrated Electronics* TMH

CS010 306(EC): Electronics Devices and Circuits

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

_ *To impart the basic concepts of discrete integrated electronics*

_ *To develop understanding about the working and operation of various circuits using discrete and integrated components*

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Module I (12hours)

Power supplies: Half wave, full wave and bridge rectifiers- L, C, LC and _ filters (working only)- Zener voltage regulator, transistor series and shunt voltage regulator, voltage regulator ICs, 78XX and 79XX series

Module II (12hours)

Transistor Amplifiers: Bipolar transistor models and characteristics, current and voltage characteristics, BJT as a switch, BJT circuits at DC, Need for biasing, Q point selection, Concepts of load line, Bias stability, Biasing in BJT amplifier circuits, Small signal operation and model, transconductance, single stage BJT amplifiers.

Module III (12hours)

Integrated Circuits: Operational Amplifier, Simplified model, Ideal OP-Amp approximation and characteristics, Non inverting amplifier, Inverting amplifier, OP-Amp characteristics, Voltage follower, Difference Amplifier, Instrumentation amplifier, Summation amplifier.

Module IV (12hours)

Feedback: Concept of feedback, positive and negative feedback, types of feedback, Effect of feedback on amplifier performance, Stability of feedback circuits.

Oscillators: Condition for oscillators, General form of oscillator circuit, RC phase shift oscillators, Wein bridge oscillator using OP-Amp, Working of Hartley, Colpitt's and crystal oscillators

Module V (12hours)

RC circuits: Response of high pass and low pass RC circuits to sine, step, pulse and square inputs, clipping and clamping circuits, RC integrator and differentiator, Working of astable, mono-stable and bi-stable multivibraors using OP-Amp, Working of Schmitt trigger, 555 timer and its application.

Reference Books

1. Integrated Electronics – Milman , Halkias – TMH
2. Microelectronic circuits – Sedra , Smith – Oxford university press
3. Fundamentals of microelectronics – B Razavi - Wiley
4. Design with Op-Amp and analog integrated circuits – S Franco – TMH
5. Pulse, digital and switching waveforms – Milman, Taub - TMH

CS010 307(P): Programming Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To acquaint the students with the fundamentals of programming.*
- *To provide the students with good knowledge in C programming and develop problem solving skills.*

1. Familiarisation with computer system compliers, editors and operating systems etc.

2. Familiarisation with office packages

3. Programming experiments in C to cover input output statements, control statements, functions, string, arrays, Structures, pointers and files.

4. Programes to find factorial, Fibonacci series, palindrome, matrix operations, sort a set of names, search etc.

Any experiment according to the syllabus of CS010 303 can be substituted.

CS010 308 LOGIC DESIGN LAB

Teaching scheme **Credits:** 2

3 hours Practical per week

Objectives:-

To provide an introduction to Logic Systems Design thereby giving a hands on experience on working with digital ICS ,which enable the study Computer System Architecture.

1. Familiarization of Logic Gates and Realization of Logic Circuits using basic Gates.
2. Design and implementation of Arithmetic Circuits:- Half Adder, Full Adder, n bit Ripple Carry Adder, Carry Look ahead Adder, BCD Adder
3. Study of Flip Flops:- implementation of RS, JK, D, T and MS Flip Flops
4. Design and implementation of Synchronous and Asynchronous Counters, UP/DOWN Counters
5. Design and Implementation of Shift Registers, Counters using Shift Registers – Ring Counter and Johnson Counter
6. Study of Multiplexers , Demultiplexers, Encoder and Decoder
7. Design of Comparators and Parity Generators.

EN010401 Engineering Mathematics III

(Common to all branches)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives: *Apply standard methods of mathematical &statistical analysis*

MODULE 1 Fourier series (12 hours)

Dirichlet conditions – Fourier series with period 2 π and 2l – Half range sine and cosine series – Harmonic Analysis – r.m.s Value

MODULE 2 Fourier Transform (12 hours)

Statement of Fourier integral theorem – Fourier transforms – derivative of transforms- convolution theorem (no proof) – Parsevals identity

MODULE 3 Partial differential equations (12 hours)

Formation by eliminating arbitrary constants and arbitrary functions – solution of Lagrange's equation – Charpits method –solution of Homogeneous partical differential equations with constant coefficients

MODULE 4 Probability distribution (12 hours)

Concept of random variable , probability distribution – Bernoulli's trial – Discrete distribution – Binomial distribution – its mean and variance- fitting of Binominal distribution – Poisson distribution as a limiting case of Binominal distribution – its mean and variance – fitting of Poisson distribution – continuous distribution- Uniform distribution – exponential distribution – its mean and variance – Normal distribution – Standard normal curve- its properties

MODULE 5 Testing of hypothesis (12 hours)

Populations and Samples – Hypothesis – level of significance – type I and type II error – Large samples tests – test of significance for single proportion, difference of proportion, single mean, difference of mean – chi –square test for variance- F test for equality of variances for small samples

References

1. Bali& Iyengar – A text books of Engg. Mathematics – Laxmi Publications Ltd.
2. M.K. Venkataraman – Engg. Mathematics vol II 3rd year part A & B – National Publishing Co.
3. I.N. Sneddon – Elements of partial differential equations – Mc Graw Hill
4. B.V. Ramana – Higher Engg. Mathematics – Mc Graw Hill
5. Richard A Johnson – Miller Fread's probability & Statistics for Engineers- Pearson/ PHI

6. T. Veerarajan – Engg. Mathematics – Mc Graw Hill
7. G. Haribaskaran – Probability, Queueing theory and reliability Engg. – Laxmi Publications
8. V. Sundarapandian - probability ,Statistics and Queueing theory – PHI
9. H.C.Taneja – Advanced Engg. Mathematics Vol II – I.K.International
10. A.K.Mukhopadhyay-Mathematical Methods For Engineers and Physicists-I.K.International

CS010 402: Object Oriented Programming

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of object oriented programming in C++.*
- *To provide sufficient knowledge about developing real world projects with object oriented concepts.*

Module I (8 hours)

Introduction to OOP - Evolution of object oriented languages - Need of Objects - Definition of Object-Oriented Language – Classes and Objects – Creating and Using Classes and objects – Member functions and variables – Constructors –multiple and parameterized constructors- copy constructors –constructors with default arguments- Destructors.

Module II (13 hours)

Inheritance and Access Control - Member access control in classes – Friend functions and classes – Extending classes - Public Private and Protected Inheritance – Classification of Inheritance – Single – Multiple – Multilevel – Hierarchical – Hybrid.

Module III (14 hours)

Polymorphism – Runtime and compile time polymorphism – overloading functions and operators – selecting friend member function for operator overloading - Virtual methods – pure virtual methods – Abstract classes - applications of abstract classes.

Module IV (13 hours)

Virtual Destructors – Virtual Base Classes - Template- class templates and function templates- Creating and using templates – Namespaces-Dynamic Objects - Dynamic object allocation - Inline functions. Exception Handling-basics of exception handling-exception handling mechanism- Throwing and Catching Mechanism-Rethrowing and Specifying exceptions.

Module V (12 hours)

Data file operations –opening and closing files-reading and writing from file-Classes and file operations-Other object oriented languages – Java – Object oriented features in Java – Comparison with C++-Object oriented system development-object oriented notations and graphs-object oriented analysis-object oriented design.

Reference Books

1.. Robert Lafore :*Object Oriented Programming in C ++*, 3rd Edition, Galgotia Pub, New Delhi
2. E. Balaguruswamy : *Object oriented Programming with C++*,2nd Edition, Tata McGraw Hill, New Delhi, 2004
3. Dilkeshwar Pandey,Upendra K Tiwari, *Object Oriented Programming with Java*, Acme Learning (Module V), New Delhi ,2010
4. D Ravichandran: *Programming with C++* , 3rd Edition ,Tata McGraw Hill, New Delhi
5. Bjarne Stroustrup , *The C++ Programming Language*, 3rd Edition..,
6. Randal Albert, Todd Breedlove: *C++ ,An Active Learning Approach*, Jones And Bartlett Publishers, New Delhi ,2010
7. Deitel & Deitel, *C++ How To Program, Introducing Object-Oriented Design with the UML*, 3rd Edition Pearson
8. Matt Weisfeld: *The Object Oriented Thought Process* ,3rd Edition,Pearson Education, New Delhi ,2009
9. Jyoti Singh: *Object Oriented Systems & Concepts of C++;* Acme Learning, New Delhi,2010
10. Poornachandra Sarang: *Object Oriented Programming with C++*, 2nd Edition, PHI, New Delhi,2009
11. R. Rajaram, *Object Oriented Programming and C++*,2nd Edition,,New Age International Publishers, New Delhi,2007
12. E. Balaguruswamy, *Programming with Java*, 2nd Edition, Tata McGraw Hill, New Delhi
13. Bhushan Trivedi, *Programming with Ansi C++* ,Oxford Higher Education, New Delhi,2007

CS010 403: Data Structures and Algorithms

Teaching scheme **Credits:** 4
2 hours lecture and 2 hour tutorial per week

Objectives

- *To impart the basic concepts of data structures and algorithms*
- *To develop understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures.*

Module I (10 hours)

Principles of programming – System Life Cycle - Performance Analysis and Measurements- Time and Space complexity-Complexity calculation of simple algorithms. Hashing:- Static Hashing-Hash Tables-Different Hash Functions-Mid Square-Division-Folding-Digit Analysis, Collision-Collision Resolution Techniques.

Module II (12hours)

Study of basic data structures – Arrays- Structures-Sparse matrix – Stacks – Queues-Circular queues- Priority queues - Dqueues. Evaluation of expressions – Polynomial representation using arrays.

Module III (12hours)

Linked Lists - Linked stacks and queues - Doubly linked lists – Polynomial representation using linked lists, Garbage collection and Compaction.

Module IV (14 hours)

Trees - Binary Trees – Tree Traversal – Inorder - Preorder and Postorder,
Search trees - AVL Trees, height balanced trees, Multiway search Trees- B Trees-B+ Trees. Graphs – Depth first and breadth first search.

Module V (12 hours)

Sorting methods: Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, External sorting methods.

Reference Books

1. Horowitz ,Sahni & Anderson Freed, Fundamentals of Data Structures in C, 2nd ed., Universities Press, Hyderabad, 2009
2. Rajesh K Shukla, *Data Structures Using C & C++* ,Wiley India, New Delhi, 2009
3. Yedidyah Langsam, Moshe J Augenstein, Aron M Tenenbaum, Data Stuctures using C and C++, 2nd ed., PHI Learning Private Limited, New Delhi, 1996
4. G. A. V Pai, *Data Structures and Algorithms Concepts, Techniques and Applications*, Tata McGraw Hill , New Delhi, 2008
5. G. S Baluja, *Data Structures Through C*, Dhanpat Rai & Co. , New Delhi, 2009
6. Sartaj Sahni , *Data Structures, Algorithms and Applications in C++* , 2nd ed., Universities Press, Hyderabad, 2009
7. Michael T Goodrich, Roberto Tamassia, David Mount, *Data Structures and Algorithms in C++*, Wiley India Edition, New Delhi, 2009
8. B.M. Harwani, *Data Structures and Algorithms in C++*, Dreamtech Press, New Delhi, 2010
9. Brijendra Kumar Joshi, *Data Structures and Algorithms in C*, McGraw Hill , New Delhi, 2010
10. K R Venugopal, K G Srinivasa, P M Krishnaraj, *File Structures using C++*, McGraw Hill , New Delhi, 2009
11. ISRD Group, *Data Structures using C*, McGraw Hill , New Delhi, 2010
12. Sudipta Mukherjee, , *Data Structures using C 1000 Problems and Solutions*, Tata McGraw Hill , New Delhi, 2010
13. Seymour Lipschutz, *Data Structures with C*, Schaum's Outlines, McGraw Hill , New Delhi, 2010
14. R Krishnamoorthy & G Indirani Kumaravel, *Data Structures using C*, McGraw Hill , New Delhi, 2008
15. John R Hubbard, *Data Structures with C++*, Schaum's Outlines, Tata McGraw Hill , New Delhi, 2010
16. Jean Paul Tremblay & Paul G Sorenson, *An Introduction to Data Structures with Applications*, 2nd ed., Tata McGraw Hill , New Delhi, 2010
17. Seymour Lipschutz, *Data Structures* , Schaum's Outlines, Tata McGraw Hill , New Delhi, 2006

CS010 404 SIGNALS AND COMMUNICATION SYSTEMS

Teaching scheme	**Credits:** 4
3 hours lecture and 1 hour tutorial per week	

Objectives:-

To introduce the fundamentals of Analog and Digital Signals ,their properties and introduce the relevant transforms used in Communication.

To familiarize the core ideas of Communication Engineering which in turn adds to the study of Computer Communication.

Module 1 (15 hrs):-

Introduction to Signals:- Continuous Time Signals- Discrete Time Signals- Signal Operations- Properties of Signals(Periodicity and Symmetry), Frequency Domain Representation of Continuous Time Signals-Continuous Time Fourier Series(CTFS)- Definition- properties- Examples, Continuous Time Fourier Transform(CTFT)- Definition- Properties – Examples- Concept of Frequency Spectrum, Sampling- The Sampling Theorem(proof not required)- Quantisation

Module 2 (12 hrs):-

Communication Systems:- Architecture of a Typical Communication System – Basic problems in Signal Transmission - Noise – Types of Noise- Internal and External Noise, Cross Talk- Typical parameters of Communication Systems- Signal propagation Delay, Signal to Noise Ratio, Attenuation, Bandwidth

Communication Channels:- Twisted Pairs- Coaxial Cables- Fiber Optic Cables- Capacity of a Noisy Channel- Shannon Hartley Theorem

Module 3: (15 Hrs)

Modulation- Need for Modulation

Analog Modulation- Types of analog modulation- Amplitude Modulation, Frequency modulation, Phase modulation, Pulse Modulation Schemes- Pulse Amplitude modulation(PAM), Pulse Width Modulation(PWM), Pulse Position Modulation(PPM), Pulse Code Modulation(PCM),Delta modulation, Sample problems based on different modulation methods.

Digital modulation;- Amplitude Shift Keying(ASK), Frequency Shift keying(FSK),Phase Shift Keying(PSK), Quadrature Amplitude modulation (QAM), Differential Phase Shift Keying(DPSK)

Module 4: (8 Hrs)

Multiplexing:-Time Division Multiplexing(TDM)- Frequency Division Multiplexing(FDM)- Wavelength Division multiplexing(WDM)

Switching:- Circuit, Packet and Message Switching Schemes, Case Study:- SONET(Basic ideas only)- Datagrams and virtual Circuits

Digital Transmission:- Analog to Digital Converter(ADC), Serial and parallel Transmission- Simplex, Half Duplex and Full Duplex Transmissions.

Module 5: (10 Hrs)

Error Correction and Detection;- Line Coding Schemes- Block Coding- Convolution Coding- Hamming Codes

Transmission Codes:- Different Character Codes- ASCII, EBCDIC, Baudot Code, Bar Coding, Parity Coding

Reference Books

1. S.Haykin and B. V. Veen, *Signals and Systems*, John Wiley & Sons, N. Y., 2002
2. George Kennedy, Bernard Davis - *Electronic Communication Systems*-Tata McGraw Hill
3. Behrouz Forouzan- *Data Communication and Networking*- Tata McGraw Hill
4. Michael J Roberts, Govind Sharma- *Fundamentals of Signals and Systems*-Tata McGraw Hill
5. William Stallings- *Data and Computer Communications*- Prentice Hall of India
6. Fred Halsall- Digital Communication, *Computer Networks and Open Systems* Pearson Education
7. Taub and Schilling – *Principles of Communication Systems*- Tata McGraw Hill
8. Kolimbiris H.- *Digital Communication Systems*- Pearson Education

CS010405: Microprocessor Systems

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of microprocessors and interfacing concepts.*
- *To develop an understanding about the assembly level programming.*

Module I (10 hours)

Architecture of 8085 – Registers. Instruction set of 8085 - Instruction Types – Arithmetic – Logic data transfer, Branch, Stack, I/O and Machine Control instructions - Addressing Modes - Direct and Indirect Addressing - Immediate Addressing - Implicit Addressing.

Module II (12 hours)

Subroutines - Stack Operations - Call Return sequence- Programming Examples. Timing and control unit – The fetch operation – Machine cycle and T- State instruction and data flow. Address space partitioning - Memory mapped I/O - I/O mapped I/O.

Module III (14 hours)

Interrupts of 8085 - Hardware & Software Interrupts – Enabling, Disabling and masking of interrupts – Polling – HALT & HOLD states – Programmable interrupt controller – 8259.

Module IV (12 hours)

Data transfer schemes - Programmed data transfer - synchronous and asynchronous transfer - interrupt driven data transfer – DMA data transfer. Study of Interfacing ICs **– 8257,8255** programmable peripheral interface (compare it with 8155).

Module V (12 hours)

Programmable interval timer 8253, 8251 **-,**Interfacing Keyboard and display devices, Hardware and Software approach – USART 8251. (interfacing chips functions and internal block diagram only).

Reference Books

1. Gaonkar -Microprocessor Architecture, *Programming and Applications with the 8085* - New Age International
2. Renu Singh, B. P. Singh -*Microprocessors, interfacing and Applications* New Age International-Third Edition
3. N K Srinath -*8085 Microprocessors programming and interfacing* - PHI
4. Adithya P. Mathur -*Introduction to Microprocessors Systems* - PHI
5. KK Tripathi, Rajesh K Gangwar -*Microprocessorand its Applications* -Acme learning
6. R.Theagarajan,S.Dhanasekaran,S.Dhanapal –*Microprocessor and ITS Applications* New Age International
7. N Senthil Kumar,M saravanan,s.jeevananthan-*Microprocessor and microcontrollers* -Oxford higher education

CS 010 406: Theory of Computation

(Common with IT010 404)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To impart the basic concepts of theory of automata ,languages and computation.*
- *To develop understanding about machines for sequential computation, formal languages and grammars , and classification of feasible and intractable problems.*

Module I (10 hours)

Proving techniques-Mathematical induction -Diagonalization principle –Pigeonhole principle-Functions – Primitive recursive and partial recursive functions – Computable and non computable functions—-Formal representation of languages – Chomsky Classification.

Module II (13 hours)

Introduction to Automata theory – Definition of Automation – Finite Automata –Language acceptability by Finite Automata –Deterministic and Nondeterministic finite automation-Regular Expressions – Finite Automation with $\in$-Transitions –Conversion of NFA to DFA - Minimisation of DFA-DFA to Regular Expressions conversion-pumping lemma for regular languages – Applications of finite automata-NFA with o/p (moore /mealy)

Module III (12 hours)

Context Free Grammar –Simplification of CFG-Normal forms-Chomsky Normal form and Greibach Normal form- pumping lemma for Context free languages- Applications of PDA - Pushdown Automata – Formal definition – Language acceptability by PDA through empty stack and final state – Deterministic and nondeterministic PDA – designing of PDA-

Module IV (13 hours)

Turing Machines – Formal definition – Language acceptability by TM –TM as acceptors, Transducers - designing of TM- Two way infinite TM- Multi tape TM - Universal Turing Machines- Church's Thesis-Godelization.- - Time complexity of TM - Halting Problem - Rice theorem - Post correspondence problem-Linear Bounded Automata.

Module V (12 hours)

Complexity classes- Tractable problems– Class P –P Complete-Reduction problem-Context grammar nonempty-Intractable problems- Class NP – NP Complete- Cooks theorem-Reduction problems-SAT-Clique-Hamiltonian-TSP-Vertex Cover-NP Hard problems.

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Reference Books

1. K.L.P. Mishra, N. Chandrashekharan , *Theory of Computer Science* , Prentice Hall of India
2. Michael Sipser, *Introduction to the Theory of Computation,* Cengage Learning,New Delhi,2007
3. Harry R Lewis, Christos H Papadimitriou, *Elements of the theory of computation*, Pearson Education Asia,
4. Rajendra Kumar,*Theory of Automata Language & Computation,*Tata McGraw Hill,New Delhi,2010
5. Wayne Goddard, *Introducing Theory of Computation*, Jones & Bartlett India,New Delhi2010
6. Bernard M Moret: *The Theory of Computation*, Pearson Education
7. John Hopcroft, Rajeev Motwani & Jeffry Ullman: *Introduction to Automata Theory Languages & Computation* , Pearson Edn
8. Raymond Greenlaw,H. James Hoover, *Fundamentals of Theory of Computation*,Elsevier,Gurgaon,Haryana,2009
9. John C Martin, *Introducing to languages and The Theory of Computation*, 3rd Edition, Tata McGraw Hill,New Delhi,2010
10. Kamala Krithivasan, Rama R, *Introduction to Formal Languages,Automata Theory and Computation*, Pearson Education Asia,2009
11. Rajesh K. Shukla, *Theory of Computation*, Cengage Learning, New Delhi,2009
12. K V N Sunitha, N Kalyani: *Formal Languages and Automata Theory*, Tata McGraw Hill,New Delhi,2010
13. S. P. Eugene Xavier, *Theory of Automata Formal Language & Computation,*New Age International, New Delhi ,2004

CS010 407: Data Structures Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To provide experience on design, testing, and analysis of Algorithms and Data Structures.*
- *To acquaint the students with the Data Structures used in the Computer Science field.*

1) Representation of Polynomials using Arrays and Linked List and the different operations that can be performed on Polynomials
2) Representation of Sparse Matrix using Arrays and Linked List and the different operations that can be performed on Sparse Matrices
3) Representation of Stacks using Arrays and Linked List and the different operations that can be performed on Stacks
4) Representation of Queues using Arrays and Linked List and the different operations that can be performed on Queues
5) Representation of Double Ended Queue using Arrays and Linked List and the different operations that can be performed on Double Ended Queue
6) Representation of Priority Queues using Arrays and Linked List and the different operations that can be performed on Priority Queues
7) Representation of Binary Trees using Arrays and Linked List and the different operations that can be performed on Binary Trees
8) Representation of Graphs using Arrays and Linked List and the different operations that can be performed on Graphs
9) Infix, Postfix and Prefix conversions.
10) Different Sorting and Searching methods.
11) String representation using Arrays and Linked List and different pattern matching algorithms
12) Implementation and operations on B-Tree and B+Tree

Any experiment according to the syllabus of CS010 403 can be substituted.

CS010 408(EC) ELECTRONIC CIRCUITS AND COMMUNICATION LAB

Teaching scheme **Credits:** 2

3 hours Practical per week

Objectives:-

To provide an introduction to Electronic Circuits Design thereby giving a hands on experience on working with various Electronic Components, and Devices

PART 1 (Electronic Circuits):-

1. Design of Two Stage RC Coupled Amplifiers
2. Design of FET Amplifiers
3. Design of Bootstrap Sweep Generators
4. Design of Astable, Monostable, and Bistable Multivibrators (3 experiments)
5. Design of Oscillators(RC Phase Shift Oscillator, Hartley Oscillator, Colpitt's Oscillator – 3 experiments)

PART 2 (Communication Engineering):-

1. Amplitude Modulation
2. Frequency Modulation
3. Delta Modulation
4. Pulse Amplitude Modulation (PAM)
5. Pulse Width Modulation (PWM)
6. Amplitude Shift Keying (ASK)
7. Phase Shift Keying (PSK)

Note: - A minimum of 5 experiments from each part must be done.

Reference Books:-

1. Boylestead and Nashelky- Electronic Devices and Circuits- Prentice Hall of India
2. George Kennedy - Electronic Communication Systems - TMH

EN010501 B Engineering Mathematics IV

(CS, IT)

Teaching scheme **Credits: 4**

2 hours lecture and 2 hour tutorial per week

Objectives: *To use basic numerical techniques for solving problems and to know the importance of learning theories in mathmatics and in queueing system.*

MODULE 1 Finite differences (12 hours)

Finite difference operators $\Delta, \nabla, E, \mu \quad \delta$ - interpolation using Newtons forward and backward formula – Newton's divided difference formula - Numerical differentiation using Newtons forward and backward formula – Numerical integration – Trapezoidal rule – Simpsons 1/3rd and 3/8th rule

MODULE 2 **Z** transforms (12 hours)

Definition of Z transforms – transform of polynomial function and trignometric functions – shifting property , convolution property - inverse transformation – solution of 1st and 2nd order difference equations with constant coifficients using Z transforms.

MODULE 3 Discrete numeric functions (12 hours)

Discrete numeric functions – Manipulations of numeric functions- generating functions – Recurrence relations – Linear recurrence relations with constant coefficients – Homogeneous solutions – Particular solutions – Total solution – solution by the method of generating functions.

MODULE 4 Complex integration (12 hours)

Functions of complex variable – analytic function - Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's series- Laurent's series – Zeros and singularities – types of singularities – Residues – Residue theorem – evaluation of real integrals in unit circle – contour integral in semi circle when poles lie on imaginary axis.

MODULE 5 Queueing Theory (12 hours)

General concepts – Arrival pattern – service pattern – Queue disciplines – The Markovian model M/M/1/∞ , M/M/1/N – steady state solutions – Little's formula.

References

1. C.L.Liu and D.P. Mohapatra – Elements of Discrete Mathematics - Mc Graw Hill
2. S.Lipschutz, M.L.Lipson – Discrete mathematics –Schaum's outlines – Mc Graw Hill
3. B.V. Ramana - Higher Engg. Mathematics – McGraw Hill
4. Babu Ram – Engg. Mathematics -Pearson.
5. K Venkataraman- Numerical methods in science and Engg -National publishing co

6. V. Sundarapandian - probability ,Statistics and Queueing theory - PHI
7. S.Bathul – text book of Engg.Mathematics – Special functions and complex variables –PHI
8. H. Weif HSU – probability, random variables & Random processes – Schaum's out lines - Mc Graw Hill
9. T.Veerarajan - probability ,Statistics & Random processes - Mc Graw Hill
10. H.C.Taneja – Advanced Engg. Mathematics Vol II – I.K.International

EN010 502(ME): Principles of Management

(Common with EN010 402(ME))

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To develop an understanding of different functional areas of management.*
- *To understand the functions and duties an individual should perform in an organisation.*

Module I (12 hours)

Management Concepts: Vision, Mission, Goals and Objectives of management-MBO-Scientific management- Functions of management- Planning- Organizing- Staffing-Directing- Motivating- Communicating- Coordinating- Controlling- Authority and Responsibility- Delegation- Span of control- Organizational structure- Line, Line and staff and Functional relationship.

Module II (12 hours)

Personnel Management: Definition and concept- Objectives of personnel management-Manpower planning- Recruitment and Selection of manpower- Training and development of manpower- Labour welfare- Labour turnover- Quality circle- Industrial fatigue- Industrial disputes-Method of settling disputes- Trade unions.

Module III (12 hours)

Production management: Objectives and scope of production management- Functions of production department- production management frame work- product life cycle-Types of production- Production procedure- Project planning with CPM and PERT- Basic concepts in network.

Module IV (12 hours)

Financial Management: Objectives and Functions of Financial Management- Types of Capital- Factors affecting working capital- Methods of financing.
Cost Management: Elements of cost- Components of cost- Selling Price of a product.

Module V (12 hours)

Sales and Marketing Management: Sales management- Concept- Functions of sales department- Duties of sales engineer- Selling concept and Marketing concept- Marketing-Definition and principles of marketing- Marketing management and its functions- Sales forecasting- Pricing- Advertising- Sales promotion- Channels of distribution- Market research.

Text Books

1. Koontz and Weihrich, *Essentials of Management*, Tata McGraw Hill.
2. Mahajan M., *Industrial Engineering and Production Management*, Dhanpat Rai and Co.
3. Kemthose and Deepak, *Industrial Engineering an Management*, Prentice Hall of India.

Reference Books

1. Martand Telsang, *Industrial Engineering and Production Management.*
2. Khanna O.P., *Industrial Engineering and Management*, Dhanpat Rai and Co.
3. Philip Kotler, *Marketing Management*, Prentice Hall of India.
4. Sharma S. C. & Banga T. R., *Industrial Organisation and Engineering Economics*, Khanna Publishers.
5. Prasanna Chandra, *Financial Management*, Tata McGraw Hill.

CS010 503: Database Management Systems
(Common with IT010 506)

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart an introduction to the theory and practice of database systems.*
- *To develop basic knowledge on data modelling and design of efficient relations.*
- *To provide exposure to oracle database programming.*

Module I (10 hours)

Basic Concepts - Purpose of Database Systems- 3 Schema Architecture and Data Independence- Components of DBMS –Data Models, Schemas and Instances-Data Modeling using the Entity Relationship Model-Entity types, Relationship Types, Weak Entity Types .

Module II (14 hours)

Relational Model Concepts –Constraints – Entity Integrity and Referential Integrity, Relational Algebra -Select, Project, Operations from Set Theory, Join, OuterJoin and Division - Tuple Relational Calculus.

SQL- Data Definition with SQL - Insert, Delete and Update Statements in SQL, Defining Domains, Schemas and Constraints, Constraint Violations - Basic Queries in SQL - Select Statement, Use of Aggregate functions and Group Retrieval, Nested Queries, Correlated Queries – Views.

Module III (12 hours)

Oracle Case Study : The Basic Structure of the Oracle System – Database Structure and its Manipulation in Oracle- Storage Organization in Oracle.- Programming in PL/SQL- Cursor in PL/SQL - Assertions – Triggers.

Indexing and Hashing Concepts -: Ordered Indices, Hash Indices, Dense and Sparse Indices, Multi Level Indices, Cluster Index, Dynamic Hashing.

Module IV (11 hours)

Database Design– Design Guidelines– Relational Database Design – Functional Dependency- Determination of Candidate Keys, Super Key, Foreign Key, Normalization using Functional Dependencies, Normal Forms based on Primary keys- General Definitions of First, Second and Third Normal Forms. Boyce Codd Normal Form– Multi-valued Dependencies and Forth Normal Form – Join Dependencies and Fifth Normal Form – Pitfalls in Relational Database Design.

Module V (13 hours)

Introduction to Transaction Processing- Transactions- ACID Properties of Transactions- Schedules- Serializability of Schedules- Precedence Graph- Concurrency Control – Locks and Timestamps-Database Recovery

Query processing and Optimization- Translating SQL Queries into a Relational Algebra Computing Select, Project and Join

Object Relational Databases-Distributed Databases-Different Types-Fragmentation and Replication Techniques-Functions of DDBMS.

Reference Books

1. Elmsari and Navathe, *Fundamentals of Database System,* Pearson Education Asia, 5th Edition, New Delhi, 2008.
2. Henry F Korth, Abraham Silbershatz , *Database System Concepts*, Mc Graw Hill 6td Edition, Singapore, 2011.
3. Elmsari and Navathe, *Fundamentals of Database System,* Pearson Education Asia, 3rd Edition, New Delhi,2005, for oracle
4. Alexis Leon and Mathews Leon, *Database Management Systems,* Leon vikas Publishers, New Delhi.
5. Narayanan S, Umanath and Richard W.Scamell, *Data Modelling and Database Design,Ce*ngage Learning, New Delhi, 2009.
6. S.K Singh,*Database Systems Concepts,Design and Applications,* Pearson Education Asia, New Delhi, 2006.
7. Pranab Kumar Das Gupta, *Datbase management System Oracle SQL And PL/SQL,* Easter Economy Edition, New Delhi, 2009
8. C.J.Date , *An Introduction to Database Systems,* Pearson Education Asia, 7th Edition, New Delhi.
9. Rajesh Narang, *Database Management Systems,* Asoke K ghosh , PHI Learning, New Delhi, 2009.
10. Ramakrishnan and Gehrke, *Database Management Systems*, Mc Graw Hill, 3rd Edition , 2003.
11. Peter Rob and Carlos Coronel, *Database Systems*, Thomson Course Technology, 7th Edition, 2007.
12. Satinder Bal Guptha and Adithya Mittal, *Introduction to Database Management System*, University Science Publishers, New Delhi, 2010.
13. Patrick O'Neil and Elizabeth O'Neil, *Database Principles, Programming and Performance*, Morgan Kaufmann, 2nd Edition, New Delhi,2010 .
14. Ramon A Mata-Toledo and Pauline K Cushman, Schaum's OUTlines *Database Management Systems,* Tata Mc Graw Hill , New Delhi, 2007.
15. Michel Kifer, Philip M. Lewis, Prabin K .Panigrahi and Arthur Bernstein, *Database Systems An Application Oriented Approach*, Pearson Education Asia, 2nd Edition, New Delhi, 2008.

Mahatma Gandhi University

CS010 504(EC) DIGITAL SIGNAL PROCESSING

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives:- *To introduce the principles and core areas of Signal Processing, in a programmatic approach and explore the basic ideas on the applications of DSP in various fields of Science and Technology.*

Module 1: (12 Hrs)

Introduction to Signals & Systems:- Continuous Time Signals and Discrete Time Signals- Generation of Discrete Time Signals – Sampling, Elementary Discrete Time Signals- Operations on Discrete Time Signals- Convolution- Discrete Time Systems -Properties of Discrete Time Systems-Linearity, Time invariance-Causality-Stability- Linear Time Invariant (LTI) Systems Difference Equation representation of LTI Systems -The Z transform-Properties of Z transform-Inverse Z transform-System Transfer function.

Module 2: (12 Hrs)

Frequency Domain Representation of Discrete Time Signals:- Discrete Time Fourier Transform (DTFT) properties, Discrete Fourier Transform(DFT) properties& Fast Fourier Transform(FFT) Decimation in Time &Decimation in Frequency algorithms.

Module 3(13Hrs)

Finite Impulse Response Filter:- FIR Filters with Linear Phase, Need of Linear Phase, FIR Filter Design Methods- Fourier Series Method – Window Method- Design of FIR Filters using Rectangular, Triangular,Hamming, Hanning, Blackmann and Kaiser Windows. Realization of FIR Filter- Direct, Linear Phase and Cascade Realizations.

Module 4: (13 Hrs)

Infinite Impulse Response Filters:- Steps in IIR Filter Design, Conversion of Analog Filter to Digital Filter- Impulse Invariant and Bilinear Transformations, Analog Filter Design Approximations- Butterworth and Chebyshev Approximations., Realization of IIR Filter- Direct, Cascade and Parallel Realizations.

Module 5(10 Hrs)

Introduction to DSP Chips: - Basic Architecture of a DSP chip, Case Study: TMS 320, TigerSHARC Processors (Overview of Architecture and Features)

Applications of DSP:- Audio Signal Processing and Compression, Image Processing- JPEG Compression, Video Compression, Speech Processing and Recognition, Weather Forecasting, RADAR, (Brief idea only)

Text Books

1. Oppenheim A. V., Schafer R. W., Discrete-Time Signal Processing- PrenticeHall/Pearson.
2. Andreas Antoniou Digital Signal Processing Tata McGrawHill

Reference Books

1. S.K. Mithra Digital Signal Processing , A Computer Based Approach TataMcGraw Hill
2. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall of India Pvt. Ltd., 1997

CS010 505: Operating Systems

(Common with IT010 504)

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives

- *To understand the fundamental concepts and techniques of Operating Systems.*
- *To study the basic structure of Linux system.*

Module I (8 hours)

Introduction: Operating System – Batch, Multiprogrammed, Time-sharing and Real time systems – Operating system structure – Operating system operations

System Structures: Operating system service – System calls – System Programs – System structure – Simple structure, Layered approach – Kernel, Shell.

Module II (12 hours)

Process Management: Process concept – Process state, PCB – Process scheduling – Operations on processes – Interprocess communication – Multithreading –Benefits, Models

Process Scheduling: Basic concepts – Preemptive scheduling, Dispatcher – Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling.

Module III (16 hours)

Process Synchronization: The Critical-Section problem – Peterson's solution – Synchronization Hardware – Semaphores – Classic problems of synchronization – Monitors

Deadlocks: System model – Deadlock characterization – Methods for handling deadlocks – Prevention, Avoidance and Detection – Recovery from deadlock.

Module IV (14 hours)

Memory Management: Resident Monitor – Dynamic loading – Swapping – Contiguous memory allocation – Paging – Basic, Multi-level Paging – Segmentation

Virtual Memory – Demand Paging – Page Replacement algorithms – Allocation of Frames – Thrashing – Cause of thrashing.

Module V (10 hours)

File System: File concept – Access methods – Directory structure – Directory implementation – Linear list, Hash table – Disk scheduling

Case study: Linux system.

Reference Books

1. Abraham Silberschatz, Peter B.Galvin and Greg Gagne, "*Operating System Concepts*", John Wiley & Sons Inc, 8th Edition 2010.
2. D M Dhamdhere, "*Operating Systems A Concept-based Approach"*, Tata McGraw Hill, New Delhi, 2nd Edition, 2010.
3. Achyut S Godbole, *"Operating Systems"*, Tata McGraw Hill , New Delhi, 2nd Edition, 2009.
4. Elmasri, Carrick, Levine, "*Operating Systems A Spiral Approach"*, Tata McGraw Hill, New Delhi, First Edition 2010.
5. Gary Nutt, "Operating Systems", Second Edition, Addison Wesley, 2003.
6. Andew S. Tanenbaum, "*Modern Operating*", Pearson Education, Second Edition, 2001.
7. Promod Chandra P.Bhatt, "*An introduction to Operating Systems Concepts and Practice"*, PHI, New Delhi, Third Edition, 2010
8. B Prasanalakshmi, "*Computer Operating System*", CBS Publishers, New Delhi, First Edition, 2010
9. D P Sharma, "Foundation of *Operating Systems"*, EXCEL BOOKS, New Delhi, First Edition 2008
10. Brian L Stuart, "*Operating Systems Principles, Design and Applications"*, Cengage Learning, New Delhi, First Edition 2009.
11. Charles Crowley, "*Operating Systems A Design Oriented Approach"*, Tata McGraw Hill, New Delhi, First Edition 2009.
12. Pabitra Pal Choudhaury, " *Operating Systems Principles and, Design"*, PHI, New Delhi, First Edition, 2009

CS010 506: Advanced Microprocessors & Peripherals

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To understand the concepts related to advanced microprocessors.*
- *To study the basic technology of various peripherals.*
- *To have an overview of different types of communication buses and ports.*

Module I (15 hours)
8086 Architecture, Block diagram – Addressing modes – Instructions set of 8086 – data transfer – arithmetic – branch – loop – flag manipulation – shift & rotate – string instructions – writing simple program in 8086.

Module II (9 hours)
Additional features of 80286 – protected mode memory addressing – Additional features of 80386 – Paging mechanism (Flat memory model) – Additional features of Pentium Processors – Brief study of latest processors of Intel & AMD – Dual core processor(Brief idea only) .
Note: Architecture not required for the processors discussed in this module.

Module III: Peripherals (11 hours)
Study of motherboards – Different types of ports, slots and connectors – Processor Bus, AGP, PCI – Add-on cards – USB – Hard Disk Interfaces – IDE, ATA, Power supply – SMPS – function & operations.

Module IV: Storage Devices (15 hours)
Magnetic data storage: Principles – Hard disks – Cylinders – Clusters – Tracks and Sectors – Disk formatting – Partitioning – Hard disk drive operation – Data Transfer rates – Data addressing – CHS addressing – Logical Block Addressing.
Optical storage: CD Technology, CD ROM, CD-R, CD-RW, Interface – Magneto optical drives – DVD – RAID – Blu-ray disc.

Module V (10 hours)
Memory: Parity – ECC – Memory Addressing – 640 KB barrier – Extended and Expanded memory – HMA – Video memory – Flash Memory – Pen drive – Advanced memory technologies.

Reference Books

1. A K Ray, K M Bhurchandi, "*Advanced Microprocessors and Peripherals*", Tata McGraw Hill, New Delhi, 2nd Edition, 2010.
2. Craig Zacker & John Rourke, "*PC Hardware: The Complete Reference*", Tata McGraw Hill, New Delhi, First Edition, 2001.
3. Barry B.Brey, "*The Intel Microprocessors*", PHI, New Delhi, Sixth Edition, 2004.
4. Nilesh B. Bahadure, "Microprocessors", PHI, New Delhi, First Edition, 2010.
5. K.K Tripathi, Rajesh K Gangwar, "*Microprocessor and Its Application*", Acme Learning,2010
6. Douglas V Hall, "*Microprocessors and Interfacing*", Tata McGraw Hill, New Delhi, 2nd Edition, 2006
7. Scott Mueller, "*Upgrading and Repairing PC's*", Pearson Education, 17th Edition, 2006
8. Stephen J.Bigelow, "*Troubleshooting, Maintaining and Repairing PC's*", Tata McGraw Hill, New Delhi, 5th Edition, 2001

CS010 507 Database Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To acquaint the students with the implementation and fundamental algorithms of database systems.*
- *To provide experience on design, querying, and processing of data in a relational database.*

I. Experiments to implement the following

1. Relational algebra operations select, project and join.
2. Determination of Attribute Closure, Candidate Key, Functional Dependency.
3. Checking Serializability of a Schedule.
4. Dynamic Hashing.

II. Experiments in any relational database for the following

1. Creation, Insertion, Updation, Deletion of Tables, Indexes, Views.
2. Simple Queries, Nested Queries, Use of Arithmetic and String Functions.
3. Simple PL/SQL Programs, Use of Exceptions, Cursor, Procedure, Function, Trigger, Sequence.
4. Report Generation
5. ODBC/JDBC Interface.

Any experiment according to the syllabus of CS010 503 can be substituted.

Resources:
1 SQL,PL/SQL"Ivan Bayross", BPB Publication 3rd Ed.

CS010 508: Hardware and Microprocessors Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To acquaint the students with the implementation and fundamental algorithms of database systems.*
- *To provide experience on design, querying, and processing of data in a relational database.*
- *To familiarise the students with 8085,8086,masm programming and various PC hardware components*
- *To provide experience on design, querying, and processing of data in a relational database.*

Phase I

1. Familiarization of 8085 training Kit.

2. Simple programs using 8085 Kit.

Phase II

3.Study of MASM Programming.

4.Simple programs in 8086 using MASM.

Phase III.

5.Familiarisation with PC Components.

6.Experiments based on various hardware components.

7.Experiments for communication with peripheral devices using C and MASM

NB: Students should do the experiments in all the phases. External examiner can conduct University Examinations on any of these phases.

CS010 601: Design And Analysis Of Algorithms

(Common with IT010 605)

Teaching scheme **Credits:** 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To develop an understanding about basic algorithms and different problem solving strategies.*
- *To improve creativeness and the confidence to solve non-conventional problems and expertise for analysing existing solutions.*

Module I (13 hours)

Introduction and Complexity

What is an algorithm – Properties of an Algorithm, Development of an algorithm, Pseudo-code Conventions, Recursive Algorithms – Performance Analysis - Space and Time Complexity –Asymptotic Notations – 'Oh', 'Omega', 'Theta', Worst, Best and Average Case Complexity, Running Time Comparison, Common Complexity Functions -Recurrence Relations – Solving Recurrences using Iteration and Recurrence Trees – Example Problems – Profiling - Amortized Complexity.

Module II (11 hours)

Divide and Conquer - Control Abstraction, Finding Maximum and Minimum, Costs associated element comparisons and index comparisons, Binary Search, Divide and Conquer Matrix Multiplication, Stressen's Matrix Multiplication, Quick Sort, Merge Sort. – Refinements.

Module III (14 hours)

Greedy Strategy - Control Abstraction, General Knapsack Problem, Minimum Cost Spanning Trees – PRIM's Algorithm, Kruskal's Algorithm, Job sequencing with deadlines.

Dynamic Programming - Principle of Optimality, Multistage Graph Problem, Forward Approach, Backward Approach, All-Pairs Shortest Paths, Traveling Salesman Problem.

Module IV (11 hours)

Backtracking – State Space Tree - Fixed Tuple and Variable Tuple Formulation - Control Abstraction – Generating Function and Bounding Function - Efficiency of the method - Monte Carlo Method – N-Queens Problem, Sum of Subsets.

Branch and Bound Techniques – FIFO, LIFO, and LC Control Abstractions, 15-puzzle.

Module V (11 hours)

Sophisticated Algorithms - Approximation Algorithms – Planar Graph Coloring, Vertex cover - String Matching Algorithms – Rabin Karp algorithm - Topological Sort - Deterministic and Non-Deterministic Algorithms.

Lower Bound Theory - Comparison Trees for Searching and Sorting, lower bound on comparison based algorithms, Sorting, Selection & Merging; Oracles and Adversary Arguments –Merging,Basic concepts of randomized algorithm-Las Vagas algorithm for search.

Reference Books

1. Ellis Horowitz and Sartaj Sahni, Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms,*Universities Press, 2nd Edition, Hyderabad .
2. Thomas Coremen, Charles, Ronald Rives, *Introduction to algorithm,* PHI Learning
3. Sara Baase & Allen Van Gelder , *Computer Algorithms – Introduction to Design and Analysis,* Pearson Education..
4. Anany Levitin, *Introduction to The Design & Analysis of Algorithms,* Pearson Education, 2nd Edition, New Delhi, 2008.
5. Berman and Paul, *Algorithms*, Cenage Learning India Edition, New Delhi, 2008.
6. S.K.Basu , *Design Methods And Analysis Of Algorithms* ,PHI Learning Private Limited, New Delhi,2008.
7. Jon Kleinberg and Eva Tardos, *Algorithm Design*, Pearson Education, New Delhi, 2006.
8. Hari Mohan Pandey, *Design Analysis And Algorithms*, University Science Press, 2008.
9. R. Panneerselvam, D*esign and Analysis of Algorithms*, PHI Learning Private Limited, New Delhi, 2009.
10. Udit Agarwal, *Algorithms Design And Analysis*, Dhanapat Rai & Co, New Delhi, 2009.
11. Aho, Hopcroft and ullman, *The Design And Analysis of Computer Algorithms*, Pearson Education, New Delhi, 2007.
12. S.E.Goodman and S. T. Hedetmiemi, *Introduction To The Design And Analysis Of Algorithms*, McGraw-Hill International Editions, Singapore 2000.
13. Richard Neapolitan, Kumarss N, *Foundations of Algorithms*, DC Hearth &company.
14. Sanjay Dasgupta, Christos Papadimitriou, Umesh Vazirani, Algorithms, Tata McGraw-Hill Edition.

CS010 602: Internet Computing

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart the basic concepts of Internet Computing and Java Programming*
- *To develop understanding about Internet Computing with the help of Java Platform and establishing network connections using Socket Programming*

Module I (10hours)
Introduction to Java- Genesis of Java- Features of Java –Data Types-Variables and Arrays-Operators- Control Statements – Selection Statements – Iteration Statements- Jump Statements.

Module II (12 hours)
Creating & using classes in Java – Methods and Classes – Inheritance – Super Class – Method Overriding –Packages and Interfaces – Implementing Interfaces- Exception Handling – Exception Types, Threads-Multithreaded programs, Thread Priorities and Thread synchronization.

Module III (14hours)
I/O – I/O Basics – Byte Streams and Character Streams, Reading Console Input, Collections Framework, Applets & Applet Architecture-Applet Skelton- Passing Parameters to Applet, Event Handling-Event Model- Event Classes – Event Listener Interfaces, AWT – AWT Classes – AWT Controls – Layout Managers and Menus. Swing- JApplet – Jbuttons - JTables.

Module IV (13 hours)
Network Programming with Java – Socket Programming in Java-Client Sockets- Server Sockets- Secure Server Sockets- TCP/IP Programming with Java – Datagrams, IP multicasting, Remote Method Invocation.

Module V (11 hours)
Advanced Java Programming – Accessing Databases with JDBC, Servlets, Image processing using Java – Image Filter – Web Application development using Java Technolgies- Java Server Faces.

Reference Books

1) Herbert Schildt, *Java 2 Complete reference*, 5th ed., Tata McGraw Hill, New Delhi, 2010

2) Deitel & Deitel *Java How To Program* 7th ed., Pearson Education ,New Delhi, 2008

3) Cay Horstmann *Big Java* 3rd ed., Wiley India Edition, New Delhi, 2009

4) Y Daniel Liang *Introduction to Java Programming* 7th ed., Pearson Education ,New Delhi, 2010

5) R Krishnamoorthy, S Prabhu *Internet & Java Programming*, New Age International Publishers, New Delhi, 2008

6) Rajkumar Buyya, S Thamarai Selvi, Xingchen Chu, *Object Oriented Programming with Java*, McGraw Hill, New Delhi, 2009

7) P Radha Krishna, *Object Oriented Programming through Java* Universities Press, Hyderabad2008

8) Debasish Jana, *Java and Object Oriented Programming Paradigm*, Prentice Hall of India, New Delhi, 2005

9) G Thomas Wu, *An Introduction to Object Oriented Programming with Java*,4th ed., Tata McGraw Hill, New Delhi, 2010

10) E Balagurusamy, *Programming with Java A Primer*, 4th ed., McGraw Hill, New Delhi, 2010

11) John R Hubbard, *Programming with Java*, 2nd ed., Schaum's Outlines, Tata McGraw Hill, New Delhi, 2004

Mahatma Gandhi University

CS010 603 SYSTEM SOFTWARE

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives:-

To introduce the techniques adopted in the design and implementation of System Software.

Module I (12 Hrs)

Introduction:-

System Software Vs. Application Software, Different System Software–, Macro Processor, Assembler, Linker, Loader, Text Editor, Debugger, Device Driver, Compiler, Interpreter[1] Database Management System, Operating System,[2]

Macro Preprocessor

Macro Instruction Definition and Invocation. Types of Macros – Parameterised macros, Nested macros, Recursive macros. Basic functions of Macro Preprocessor – Macro expansion, Generation of unique labels. Macro preprocessor design and Algorithm - Handling conditional Macro calls, Nested Macro calls and Recursive Macro calls.[Reference (1)] *Case Study* : *The C Preprocessor* [Web- Reference (1)]

Module - II (15 Hrs)

Assembler

Assembly Language Concepts – Mnemonic Instructions, Assembler Directives and Literals. Instruction formats and Addressing modes. Program Blocks and Control Sections. Basic Functions of Assembler. Assembler output format – Header, Text and End Records. Assembler Design – 2 Pass Assembler – Necessity of two passes and Forward reference. Algorithm for the two passes. Single Pass Assembler – Algorithm for Single Pass assembler. Handling External references – usage of Define and Refer records. Multi pass Assembler, Macro Assembler.[Reference (1)] *Case Study* : *Microsoft Macro Assembler for MS-DOS* [Reference (1), (5)] - *Microsoft OBJ file format (Basic Structure and Important Records Only)* [Reference(2)].

Module - III (12 Hrs)

Linker and Loader

Need for Linking and Loading : The absolute loader, Program Relocation, Relocating Loader, Linking external symbols. Algorithms for the two passes of a Linking Loader.[References (2),(3)] Variants of the basic model – Automatic Library Search, Linkage Editor, Dynamic Linking. [Reference(1)] *Case study* : *UNIX ELF and Microsoft DLL (basic structure only).*

Module - IV (11 Hrs)

Text Editors : Overview of Editing, User Interface, Editor Structure. [Reference (1)]

Case Study : VI Editor (Basic ideas only)[Reference (1)]

Debuggers : Debugging Functions and Capabilities, Relationship with other parts of the system, Debugging Methods- By Induction, Deduction and Backtracking, . [Reference (1) ,(8)] *Case Study : gdb* (Basic ideas only)

Module - V (10 Hrs)

Device Driver : Device Characteristics ,Design and anatomy, Types of device driver, General Design – Character Devices and character device drivers, Block Devices and Block device drivers. *Case Study: Device Driver for the PC Speaker* [References(4), (6),(7)]

REFERENCES:

1. System Software: An Introduction to Systems Programming – Leland L. Beck, Pearson Education Asia 3rd Edition.
2. Systems Programming and Operating Systems – D.M. Dhamdhere, Tata McGraw Hill Second Revised Edition.
3. Systems Programming – John J. Donovan, Tata McGraw Hill Edition 1991.
4. Writing UNIX device drivers - George Pajari -Pearson Education Asia.
5. IBM PC Assembly Language and Programming - Peter Abel Third Edition – Prentice Hall of India
6. Linux Device Drivers - Jonathan Corbet, Alessandro Rubini, Greg Kroah-Hartman – Third Edition - O.Reilly Books
7. Linux Kernel Internals- M. Beck, H. Bohme, M .Dziadzka, et al – Second Edition – Addison Wesley
8. System Software – J Nithyashri –Second Edition- Tata McGraw Hill

WEB REFERENCE:

1. http://gcc.gnu.org/onlinedocs/gcc-2.95.3/cpp_1.html The C Preprocessor

Note: separate subjects are provided in the syllabus in the Seventh and Fifth Semesters for the detailed discussion of the subjects marked [1] and [2] respectively.

Mahatma Gandhi University

CS010 604: Computer Networks

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

To develop basic knowledge on the mode of operation of different types of computer networks that are used to interconnect a distributed community of computers and various interfacing standards and protocols.

Module I (8 hours)

Network requirements, Network Architecture –layering and protocol, OSI Architecture, Internet Architecture, Performance-bandwidth and latency , Delay x bandwidth product, high speed networks .

Module II (10 hours)

Direct Link Network, Hardware Building Block, Framing-Byte Oriented Protocol, Bit Oriented Protocol , Clock Based Framing, Reliable Transmission-Stop and Wait, Sliding Window, Ethernet(802.3)-Physical properties, Access protocol, Wireless-Bluetooth, WiFi, Wimax

Module III (12 hours)

Packet Switching-Switching and Forwarding- Datagram, virtual circuit switching, Source routing Bridges and LAN Switches-Learning Bridges, Spanning tree Algorithms ,Broadcast and Multicast, Limitations of bridges, Simple Internetworking-Service Model, Global Address, Datagram Forwarding in IP, address translation, Routing-network as graph, distance vector, link state, matrix

Module IV (16 hours)

End to End Protocol, Simple de-multiplexer, Reliable Byte stream, TCP-Issues, segment format, connection establishment and termination sliding window revisited, triggering transmission, adaptive retransmission, RPC-fundamentals ,TCP Congestion control –additive increase, slow start, fast retransmit and fast recovery, congestion avoidance mechanism, DEC bit, Random Early Detection bit, Source Based Congestion avoidance

Module V (14 hours)

Applications -WWW, E-mail, Name Service, Network Management, Web Services Custom Application protocol, Generic Application Protocol ,Overlay Networks-Peer to Peer Networks.

Reference Books

1.Computer Networks A Systems Approach-Larry L.Peterson and Bruce S.Davie,4th Edition .Morgan Kaufman
2. Introduction to data communication and networking Behrouz Forozan TMH.
3 .Computer networks ,Andrew S Tanenbaum ,PHI
4.Data communication, computer networks and open systems, Halsall F ,Addison Wesley.

Mahatma Gandhi University

CS010 605 SOFTWARE ENGINEERING

Teaching scheme **Credits:** 4

3 hours lecture and 1 hour tutorial per week

Objectives:-

To familiarize the steps in designing a Computer Software System following the conventions in Engineering Design.

To introduce the fundamentals of Structured and Object Oriented Designs and Design Tools.

Module I (12 Hrs)

The Evolving role of Software – Software – The changing Nature of Software – Legacy software ,Introduction to CASE tools, A generic view of process– A layered Technology – A Process Framework – The Capability Maturity Model Integration (CMMI) – Process Assessment – Personal and Team Process Models. Product and Process. Process Models – The Waterfall Model – Incremental Process Models – Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The Spiral Model – The Concurrent Development Model – Specialized Process Models – the Unified Process.

Module - II (12 Hrs)

Management: Functions - Project planning - Software productivity - Productivity metrics - Cost estimation - COCOMO & COCOMO II - Project control - Work breakdown structures, Gantt charts, PERT charts - Dealing with deviations - Team organization - centralized, de-centralized, mixed - An assessment of organizations - Risk management – Configuration Management. Introduction to project management and planning CASE tools.

Module - III (12 Hrs)

Requirements Engineering : Requirements Engineering tasks – Initiating the requirements Engineering Process-Eliciting Requirements – Developing Use cases – Building the Analysis Models – Elements of the Analysis Model – Analysis pattern – Negotiating Requirements – Validating Requirements. SRS Document.

Module - IV (12 Hrs)

Design activity & its objectives – Function Oriented and Object Oriented Design-Modularization techniques - module structure and its representation, interface and information hiding, categories, specific techniques to accommodate change, stepwise refinement, top-down and bottom-up design - Handling anomalies. Case Study with UML and CASE Tool support.

Module - V (12 Hrs)

Implementation Techniques - Programming principles and guidelines – Structured Programming. Software Testing Fundamentals-Test Case Design-White-Box Testing-Basis Path Testing-Control Structure Testing- Black-Box Testing- Various levels of Testing : Modules to System. Case study : Test case design and Testlog preperation

References

1. Roger S.Pressman, Software Engineering: A Practitioner's Approach, McGraw Hill International edition, Seventh edition.
2. Ian Sommerville, Software Engineering, 8th Edition, Pearson Education, 2008 (UNIT V)
3. Stephan Schach, Software Engineering, Tata McGraw Hill, 2007
4. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson Education, second edition, 2001

CS010 606L01: DISTRIBUTED SYSTEMS

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- To impart an introduction to distributed systems and distributed computing.
- To develop basic knowledge on distribution of data and file systems in distributed environment.
- To provide exposure to distributed database concepts.

Module I (10 hours)
Introduction to Distributed Systems, evolution, characteristics, design issues, user requirements, Distributed computing models-workstation model, workstation-server model, processor–pool model. Protocols for distributed systems -VMTP and FLIP.

Module II (12 hours)
Client server communication, Group communication, IPC - Message passing – features.
RPC – model, implementation, stub generation, RPC messages, communication protocols marshalling.
Distributed shared memory – Architecture, design issues, thrashing, replacement strategy. Synchronization – clock synchronization, event ordering, mutual exclusion.

Module III (14 hours)
Distributed file system**:** Components of DFS, design issues, interfaces, implementation, File Caching and Replication. Sun Network File System – architecture and implementation, Google File System. Naming- Namespace and contexts and name resolution.

Module IV (12 hours)
Distributed system management**:** Features of scheduling algorithms, Task assignment approach, load balancing, load sharing, Process migration mechanisms, Threads – design issues, Fault tolerance – failures, Byzantine failures.

Module V (12 hours)
Distributed Databases: Distributed DBMS architecture, distributed query processing, transactions, concurrency control, deadlock management and Distributed Database Recovery protocols-2PC, Network Partitioning.

Reference Books

1. Sunita Mahajan, Seema shah, *Distributed Computing* ,Oxford University Press, first edition, 2010
2. George Coulouris, Jean Dellimore and Tim Kindberg, *Distributed Systems – Concepts and designing*, Pearson Education Asia, fourth Edition 2006, New Delhi.
3. Pradeep. K, Sinha, Distributed Operating Systems ,PHI Edition, first Edition,1997.
4. Andrew S Tenenbaum, Distributed Operating Systems, Pearson Education Asia

CS010 606L02 Micro controller Based Systems

(Common with EE010 503 and EC010 502)

Teaching scheme **Credits:** 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart the basic concepts of microcontrollers and their programming in assembly language and in C.*
- *It also focused on the 8051 microcontroller which is a widely used microcontroller.*

Pre-requisites: *Microprocessor systems, Advanced microprocessor and peripherals*

Module I (10 hours)

Microcontroller - Features of 8051-Arcchitecture of 8051-Pin diagram of 8051-memory organization-External memory interfacing-stacks- addressing modes-instruction set.

Module II (12 hours)

8051 programming in C-data types and time delay – I/O programming – logical operation – data conversation program –basics of serial communication connection to RS232- serial port programming in assembly and C.

Module III (14 hours)

Basics of interrupts,-interrupt sources- interrupt enable register-interrupt priority-interrupt control system-interrupt handling-single step operation- port bit latches and buffers-port structures and operation- accessing external memory.

Module IV (12 hours) Timer 0& -Timer1- T MOD SFR-mode0,mode 1,mode2,mode3-TCON SFR-serial interface-SCON SFR-mode0,mode 1,mode 2,mode3-block schematics-baud rates-power on reset circuit-ONCE mode-on chip oscillator-external program & data memory timing diagrams.

Module V (12 hours)

PIC microcontrollers: Overview and features-PIC16C6X/7X FSR-Reset action-PIC memory organization-instructions-addressing modes.

Reference Books

1. Muhammad Ali mazidi, Janice Gillispie Mazidi, Rolin D Mc kinlay , *The 8051 microcontroller and embedded systems*,person, second edition., 2006
2. V Udayashankara,M S Mallikarjunaswamy ,8051 Microcontroller hardware &software application,TMH
3. Ajay V Deshmukh,Microcontrollers, theory and applications,TMH
4. Kennath J Ayala, *The 8051 microcontroller*., Penram International
5. 1 Satish Shah,*8051 microcontrollers MCS 51 family and its variants* ,Oxford higher education

CS010 606L03: User Interface Design

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart the basic concepts of User Interface Design.*
- *To develop understanding about human computer interaction methods that utilize more general, widespread and easier-to-learn capabilities.*

Module I (8 hours)
Introduction: Importance of user interface – definition, importance of good design, brief history – Graphical User Interface – Web User Interface – Theories, Principles and Guidelines of User interface design

Module II (10 hours)
Design Process: Obstacles in development path deigning for people-Understanding Human Interaction with computers, Importance of Human Characteristics, Human consideration, Human Interaction speeds – Understanding Business function

Module III (15 hours)
Screen Designing: Design goals - screen meaning and purpose, organizing screen elements-ordering of screen data and content – screen navigation and flow – visually pleasing composition – amount of information – focus and emphasis – presenting information simply and meaningfully – information retrieval on web – Statistical graphics – Technological considerations in Interface Design.

Module IV (15 hours)
Menus and navigation schemes-structures of menus-functions of menus- contents of menus - formatting of menus – phrasing the menu- selecting menu choices-navigating menus-kinds of graphical menus- Selection of windows-Window characteristics-components of window-window presentation styles-types of windows-window management-organising window functions-window operations-Selection of device based and screen based controls - text and messages – icons and images – Multimedia – colours- uses, problems, choosing colours.

Module V (12 hours)
Distributed and Collaborative Interaction-Device consistency-distribution of the user interface-event distribution-graphical package layer-programmable API-Model semantics distribution-data layer distribution-asynchronous collaboration-Software tools-specification methods- interface building tools –evaluation and critiquing tools-Interaction devices-keyboard and function keys - pointing devices- speech recognition, digitization and generation – image and video displays – printers.

Reference Books

1. Wilbert O. Galitz,*The Essential Guide to User Interface Design,* 2nd Edn., Wiley Dreamtech,Delhi,2002
2. Ben Shneiderman, *Designing the User Interface* ,3rd Edn., Pearson Education Asia,Delhi,2002
3. Dan R. Olsen, *Human Computer Interaction,*Cengage,New Delhi,2009
4. John M. Carroll,*Human Computer Interaction*, Pearson Education Asia, Delhi,2002
5. Alan Cooper, *The Essentials of User Interface Design* , Wiley Dreamtech, Delhi,2002

CS010 606L04 : UNIX Shell Programming
(Common with IT010 606L03)

Teaching scheme **Credits:** 4

2 hours lecture and 2 hour tutorial per week

Objectives

- *To provide a fair knowledge of Unix concepts and gain sharp skills in Unix Shell programming*

Module 1. (8 hours)

Introduction to Unix:- Architecture of Unix, Features of Unix , Basic Unix Commands - Unix Utilities:- Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands - Text processing utilities and backup

Module 2. (13 hours)

Introduction to Shells:-Unix Session, Standard Streams, Redirection, Pipes, tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization. Regular expressions, Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, words or lines, Comparing Files.

Module 3. (12 hours)

grep:-Operation, grep Family, Searching for File Content. sed:-Scripts, Operation, Addresses, commands, Applications, grep and sed. awk:-Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, Mathematical Functions, User Defined Functions, Using System commands in awk, Applications of awk, grep and sed

Module 4. (15 hours)

Interactive Shells - Korn Shell, C Shell and BASH - Shell Features, Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process.

Shell Programming - Korn Shell, C Shell and BASH -

Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

Module 5. (12 hours)

Process management:- Creation, Hierarchies, Sending signals to processes, exec, termination, Zombie, waitpid etc - Network management:- tools, Client server mechanism, address resolution, ping, telnet, ftp, dns and squid – X Window System:- Overview, Architecture, starting and stopping X, X clients and display

Reference Books

1. Behrouz A. Forouzan, Richard F. Gilberg," Unix and shell Programming.", Cengage Learning
2. Sumitabha Das , "Unix the ultimate guide", TMH. 2nd Edition.
3. Kernighan and Pike, "Unix programming environment", PHI. / Pearson Education
4. Graham Glass, King Ables," Unix for programmers and users", 3rd edition, Pearson Education
5. Maurice J. Bach, "The Design of the Unix Operating System", First Edition, Pearson Education, 1999

CS010 606L05: Embedded Systems

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart the basic concepts of Embedded System and its applications*
- *To develop understanding about micro controllers and programming the micro controller for the development of Embedded systems.*

Module I (-12 hours)
Introduction to Embedded Systems-Classification of Embedded Systems-Application areas of Embedded Systems, Typical Embedded System- Memory-Sensors and Actuators-Embedded Firmware - Characteristics and Quality Attributes of Embedded Systems

Module II (13 hours)
Application Specific Embedded System – Domain Specific Embedded System, Designing Embedded Systems with 8bit Microcontrollers- Factors to be considered in selecting a Controller- Designing with 8051 microcontroller- 8052 microcontroller, Programming the 8051 microcontroller – Addressing modes of 8051 – the 8051 Instruction set

Module III (13 hours)
Hardware Software Co-Design and Program Modeling – Computational models in Embedded Design, Embedded Hardware Design and development – Electronic Design Automation Tools, Embedded Firmware Design and Development - Embedded Firmware Design Approaches - Embedded Firmware Development Languages – Programming in Embedded C.

Module IV (12 hours)
Real Time Operating System based Embedded System Design – Operating System Basics – Types of Operating Systems – Tasks- Process- Threads – Multiprocessing and Multitasking – Task Scheduling – Task Communication – Task Synchronization – Introduction to Vx Works and Micro C/OS-II RTOS

Module V (10 hours)
The Embedded System Development Environment – Integrated Development Environment , The Embedded Product Development Life Cycle – EDLC- Objectives of EDLC – Different phases of EDLC – Modeling the EDLC

Reference Books

1. Shibu K V, *Introduction to Embedded Systems*, McGraw Hill, New Delhi, 2009
2. Raj Kamal, *Embedded Systems Architecture, Programming and Design*, 2nd ed., Tata McGraw Hill , New Delhi, 2008
3. Frank Vahid & Tony Givargis, *Embedded System Design A Unified Hardware/Software Introduction*, Wiley - India Edition, New Delhi, 2010
4. Wayne Wolf , *Computers as Components Principles of Embedded Computing System Design*, , 2nd ed., Elsevier, Gurgaon, 2009
5. Steven F Barrett & Daniel J Pack , *Embedded Systems Design and Applications with the 68HC12 and HCS12*, Pearson Education, Delhi, 2008.

CS010 606L06: Advanced Software Environments

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart the basic concepts of Windows programming..*
- *To develop understanding about the new software environment and develop of software to meet the growing demand of the industry.*

Pre-requisites: *Knowledge required to study this subject (OOP concepts))*

Module I (10 hours)
Windows Programming – Components of Windows API- Distinction with ordinary programs – Event Driven Programming – WinMain Function – Creating Windows – Message loop – Window procedures - Menus & Buttons – Drawing on Windows, Advanced User Interface concepts, Developing application issues and solutions.

Module II (10 hours)
MFC Features & Advantages – MFC Classes – Life cycle of an MFC application – The CWinApp Classes – Creating windows – Message maps and event handling – Menus & Buttons - Drawing on MFC windows – Handling mouse & Keyboard events.

Module III (13 hours)
X-Windows – Clients & Servers - Basic Architecture of X-Windows systems – Layers in XWindows Architecture – XWindows Programming – Simple Hello World Application in X. Command line options and resources – connecting to X-Display – creating windows and graphics context – Handling events – creating child windows.

Module IV (13 hours)
CORBA – Introduction – Features – Fundamental concepts in Distributed objects – CORBA IDL – stub & Skeleton - implementing a simple CORBA server and CORBA client with C++.

Module V (14 hours)
CORBA object reference – Managing references at server – CORBA factories – CORBA object creation in C++ & JAVA – CORBA Exceptions – Destroying CORBA objects - comparison of CORBA & DCOM Architectures.

Reference Books

1. Yashwanth Kanetkar , Visual C++ Programming ,BPB Publications ,New Delhi, 2005.
2. Mike Blaszczals, Professional MFC with Visual C++ 6, 4th Edition, Shroff publishers & Distributors Private Limited, New Delhi, 2003.
3. Nabajyoti Bakakati, X Window System programming , 2nd Edition, Prentice-Hall of India Private Limited,New Delhi, 2001.
4. Jason Pritchard ,COM & CORBA side by side , Pearson Edition New Delhi, 2000.

CS010 607: Operating Systems Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To provide a practical exposure of all algorithms and behaviour of processes in the system with respect to all its timings.*
- *This lab also explains the allocation of process in the memory with some memory management techniques.*

(Implement the following on LINUX platform. Use C for high level language implementation)

1. Basic UNIX commands

2. Shell programming
   - Command syntax
   - Write simple functions with basic tests, loops, patterns

3. Write programs using the following system calls of UNIX operating system:
   fork, exec, getpid, exit, wait, close, stat, opendir, readdir

4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)

5. Write C programs to simulate UNIX commands like ls, grep, etc.

6. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time

7. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time

8. Implement the Producer – Consumer problem using semaphores.

9. Implement inter-process communication using shared memory.

10. Implement some memory management schemes

Example for expt 10:

Free space is maintained as a linked list of nodes with each node having the starting byte address and the ending byte address of a free block. Each memory request consists of the process-id and the amount of storage space required in bytes. Allocated memory space is again maintained as a linked list of nodes with each node having the process-id, starting byte address and the ending byte address of the allocated space.

When a process finishes (taken as input) the appropriate node from the allocated list should be deleted and this free disk space should be added to the free space list. [Care should be taken to merge contiguous free blocks into one single block. This results in deleting more than one node from the free space list and changing the start and end address in the appropriate node]. For allocation use first fit, worst fit and best fit.

CS010 608 Mini Project

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To estimate the ability of the student in transforming the theoretical knowledge studied so far into application software.*
- *For enabling the students to gain experience in organisation and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year.*
- *To understand and gain the knowledge of software engineering practices, so as to participate and manage large software engineering projects in future.*

In this practical course, each group consisting of two/three members (four in special cases) is expected to design and develop practical solutions to real life problems related to industry, institutions and computer science research. Software life cycle should be followed during the development. The theoretical knowledge, principles and practices gained from various subjects should be applied to develop effective solutions to various computing problems. The knowledge gained during various practical subjects to work with various software tools, Designing tools, programming languages, operating systems, etc. should be utilized in various stages of development. Structured/ Object Oriented design techniques may be used for the project. Software Requirements Specification (SRS), Modeling Techniques, Design and Testing strategies should be documented properly.

A committee consisting of minimum three faculty members will perform the internal assessment of the mini project. A report on mini project should be submitted for evaluation and project work should be presented and demonstrated before the panel of examiners.

Internal Continuous Assessment *(50 marks)*
40% - Design and development (30% by guide and 10% by committee)
30% - Final result and Demonstration (15% by guide and 15% by committee)
20% - Report (10% by guide and 10% by committee)
10% - Regularity in the class (by guide)

End Semester Examination *(Maximum Marks-100)*

20% - Demonstration of mini project
50% - Practical test connected with mini project
20% - Viva voce
10% - Project report

CS010 701: Web Technologies

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart the new concepts in Web Technologies*
- *To develop understanding about the different technologies used in the World Wide Web including XML, Perl,*

Module I (15hours)

XHTML

Evolution of HTML and XHTML- Standard XHTML Document Structure- Basic Text Markup- Images-Hypertext Links-Lists- Tables- Forms- Frames.

Cascading Style Sheets

Introduction to CSS – Levels of Style Sheets- Style Specification Formats- Selector Forms- Property Value Forms – Font Properties- List Properties – Color- Alignment of Text – Background Images- Span and Div Tags.

Module II (12 hours)

XML

Introduction to SGML – features of XML - XML as a subset of SGML – XML Vs HTML – Views of an XML document - Syntax of XML- XML Document Structure – Namespaces- XML Schemas- simple XML documents – Different forms of markup that can occur in XML documents - Document Type declarations – Creating XML DTDs – Displaying XML Data in HTML browser – Converting XML to HTML with XSL minimalist XSL style sheets – XML applications

Module III (12hours)

Perl

Origin and Use of Perl- Scalars and their Operations – Assignment Statements and Simple Input and Output – Control Statements- Fundamentals of Arrays – Hashes- References- Functions- Pattern Matching – File Input and Output – Simple programs in Perl -Using Perl for CGI Programming.

Module IV (12 hours)

PHP

Origin and Use of PHP- Overview of PHP- General Syntactic Characteristics- Operations and Expressions- Control Statements- Arrays- Functions-Pattern Matching- Form Handling- Files-Cookies-Session Tracking - Simple programs in PHP.

Module V (9 hours)

Rails

Overview of Rails- Document Requests- Processing Forms- Rails Application with Databases – Layouts.

Ajax

Overview of Ajax – Basics of Ajax – Rails with Ajax.

Reference Books

1) Robert W Sebesta, Programming with World Wide Web , 4th ed., Pearson Education ,New Delhi, 2009
2) Deitel & Deitel Internet & World Wide Web *How To Program* 4th ed., Pearson International Edition Education ,New Delhi, 2009
3) Deitel & Deitel, Nieto, Lin, Sadhu, XML How to Program, Pearson Education ,New Delhi, 2011
4) Kogent Learning Solutions Inc, Web Technologies Black Book, Dreamtech Press, New Delhi, 2009
5) Chris Bates, Web Programming Building Internet Applications 3rd ed., Wiley India Edition, New Delhi, 2009
6) Phil Ballard, Michael Moncur, Sams Teach Yourself Ajax, JavaScript and PHP, Pearson Education ,New Delhi, 2009.
7) Achyut S Godbole , Atul Kahate, Web Technologies TCP/IP Architecture and Java Programming, 2nd ed., Tata McGraw Hill Education Private Limited, New Delhi, 2010
8) Pankaj Sharma, Introduction to Web Technology, Katson Books, New Delhi, 2008
9) Bankim Patel, Lal Bihari Barik, Introduction to Web Technology & Internet, Acme Learning Private Limited, New Delhi, 2009

CS010 702: COMPILER CONSTRUCTION

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

1.) • *To introduce the various techniques involved in the translation of source programs into object programs by a compiler.*
2.) · *To understand the inner working of a compiler using the various data structures used in the translation process.*

Module 1 (12Hrs)

Introduction to compilers:-Phases of a compiler-Analysis and synthesis phases-Lexical analysis and its role-Review of finite automation and Regular Expressions-Specification of tokens using regular expressions-Implementing lexical analyzer using finite automation-Design of lexical analyzer using LEX

Module 2 (12 Hrs)

Syntax analyzer-Role of syntax analyzer-Review of context free grammar-derivation and parse trees-Basic parsing approaches-Top down parsing-Recursive Descent parsing –LL(1) parsing-Bottom up parsing-Shift reduce parsing-Operator precedence parsing-LR parsing-Simple LR, Canonical LR and LALR parsers- Design of syntax analyzer using YACC

Module 3 (12 Hrs)

Semantic analysis-Need for semantic analysis-Syntax directed definitions-S attributed definitions- L- attributed definitions-Translation schemes-Type system and Type checking-Design of a simple type checker

Storage Management:-Memory allocation strategies (static, stack and heap allocations)-Memory allocation in block structured languages-Accessing local and non local data-Array allocation and access-Procedure calls-Parameter passing methods-Runtime stack and storage management

Module 4(12 Hrs)

Synthesis phase:-Intermediate Code Generation (ICG)-Need for ICG-IC Formats-3 Address code-Triples and quadruples

Code optimization:-Need for code optimizer-Basic blocks and program flow graph-Machne dependent and machine independent optimizations-Optimization transformations-Local and global optimizations

Module 5(12 Hrs)

Code Generation-Basic issues in code generation-Data descriptors-Expression trees-Generating target code from expression trees-Symbol table handling-Symbol table requirements and organization. Error handling-Types of errors-Compile time errors and recovery-Runtime errors-Runtime Error Handling ,Cross Compilers and Incremental Compilers(Brief idea only)

Reference Books

1.) .Aho A Ravi Sethi and J D Ullman, Compilers Principles Techniques and Tools,Addison Wesley
2.) Kenneth C Louden, “Compiler Construction Principles and Practice”, Cenage Learning Indian Edition
3.) D M Dhamdhare, System programming and operating system, Tata McGraw Hill & Company
4.) Tremblay and Sorenson, The Theory and Practice of Compiler Writing - Tata McGraw Hill & Company

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CS010 703: COMPUTER GRAPHICS

Teaching scheme **Credits:** 3

2 hours lecture and 1 hour tutorial per week

Objectives:-

To understand the basic concepts of Computer Graphics & display techniques.

Module I (3 Hrs)

Introduction: Applications of Computer Graphics, Raster scan and Random scan displays **[1]**– Video Display Devices, Display files – graphical input & output devices-Flat panel displays, Hardcopy Output Devices, Physical Interactive Devices , Data generation devices.**[2]**

Module II (10 Hrs)

2D Graphics: Output primitives-Line drawing algorithms – DDA, Bresenham's – Bresenham's Circle drawing algorithm – Other curves,polynomials and spline curves-2D viewing transformation-clipping-Cohen-Sutherland line clipping –polygon clipping-2D Transformations**[1]**

Module III (12 Hrs)

3D Graphics: 3D Transformations, 3D display methods, 3D Object Representation – Polygon Surfaces – Curved lines and surfaces-Quadric surfaces – Spline Representations – Cubic Spline Interpolation Methods-Bezier Curves and Surfaces – B-Spline Curves and Surfaces, Sweep representation,Octrees.**[1]**

Module IV (10 Hrs)

3D Rendering: Three-Dimensional Viewing – Projections **[3]**, Visible Surface Detection – Classification of Visible surface detection algorithms – Back-face Detection, Depth- Buffer Method, Scan-line Method. **[1,3]**

Module V (10 Hrs)

Rendering: Surface Rendering Methods- Basic illumination Models – Polygon–rendering Methods,Interpolative shading methods-Constant shading, Gouraud shading,Phong shading, Texture Mapping.**[3]**

Fractal Geometry Methods – Classification of Fractals – Self-Squaring Fractals, Ray Tracing and Ray Casting.**[1]**

REFERENCES:

1. Computer Graphics (C version) - Donald Hearn & Pauline Baker (Pearson Education Asia)
2. Procedural Elements for Computer Graphics –David F. Rogers, TATA McGraw Hill edition-second edition.
3. Computer Graphics - Zhigang Xiang & Roy A Plastack, Schaum's Series McGraw Hill edition.

CS010 704 : Object Oriented Modeling and Design

Teaching scheme **Credits:** 3
2 hours lecture and 1 hour tutorial per week

Objective

- *To impart ideas on building systems through the object oriented modelling approach using the Unified Modelling Language.*

Module 1 (10 hours)

Introduction: object oriented development-modeling concepts – object oriented methodology – models – object oriented themes-Object Modeling– links and associations – advanced links and association concepts – generalization and inheritance - grouping constructs – a sample object model

Advanced Object Modeling: aggregation – abstract classes – generalization as extension and restriction – multiple inheritance – metadata – candidate keys – constraints.

Module 2 (10 hours)

Dynamic modeling: Events and states – Operations – Nested state diagrams – Concurrency – Advanced dynamic modeling concepts – A sample dynamic model – Relationship of Object and Dynamic models.

Functional modeling: Functional models – Data Flow Diagrams - Specifying operations – Constraints – A sample functional model – Relation of functional to Object and Dynamic models.

Module 3 (10 hours)

Analysis: Analysis in object modeling, dynamic modeling and functional modeling, Adding operations- Iterating the analysis

System Design: Breaking system into subsystems - Identifying concurrency-allocating subsystems to processors and tasks, managing of data stores. Handling of global resources- handling boundary conditions-Common Architectural Frameworks

Module 4 (8 hours)

Object Design: Overview of Object design – Combining the three models – Designing algorithms – Design optimization – Implementation of control – Adjustment of inheritance - Design of association – Object representation – Physical packaging – Documenting design decisions-Comparison of methodologies

Module 5 (7 hours)

Unified Modeling language: Introduction, UML Diagrams – Class diagrams, Sequence diagrams, Object diagrams, Deployment diagrams, Use case diagrams, State diagrams, Activity diagram, Component diagrams – Case Study.

Reference Book

1. Object Oriented Modeling and Design -James Rumbaugh, Prentice Hall India
2. UML Distilled – Martin Fowler, Addison Wesley
3. Object- oriented Systems analysis and design using UML- 4th ed., Simon Bennet,Stephen McRobb, Ray Farmer. TMH.
4. Object Oriented Analysis and Design with Applications - Grady Booch, Pearson Education Asia

CS010 705: PRINCIPLES OF PROGRAMMING LANGUAGES

Teaching scheme **Credits:** 3

2 hours lecture and 1 hour tutorial per week.

Objectives

- *To provide an overview of the key paradigms used in developing modern programming languages.*
- *To explore the implementation details of languages to provide an understanding of the source program and its execution behavior.*

Module I (9 Hours)

Introduction – Role of programming languages - Programming domains - Language evaluation criteria - Influence on language design - Implementation methods - Virtual computers - Bindings - Concept of binding.

Module II (9 Hours)

Data types - Implementation of data types - Primitive, User defined – Names –Variables - Type checking - Strong Typing - Type compatibility -Scope – Lifetime - Referencing environments - Named constants – Virtualization - Heap management.

Module III (8 Hours)

Expressions , Assignments and Control Structures – Arithmetic expressions – Assignment statements-Compound statements - Selection statements - Iterative statements – Unconditional branching – Guarded commands.

Module IV (10 Hours)

Subprograms-Fundamentals-Design issues-Local Referencing Environment-Parameter passing methods –Subprogram names as parameters – Overloaded Subprograms – Generic Subprograms – Separate & independent compilation – Design issues for functions – Accessing non-local environments – User defined overloaded operators – Co-routines.

Module V (9 Hours)

Implementation of Subprograms – General semantics of calls & returns- Activation Records – Blocks – Recursion

Exceptions and Programming Paradigms - Exception handling in C++, Java, PL/I, Ada , Fundamentals of Functional programming language – Examples – LISP Interpreter -Overview of Logic programming - Basic elements of Prolog.

References

1. Robert W. Sebesta , “Concepts of Programming Languages” 4th Ed,2001.
2. Ravi Sethi ”Programming Languages-concepts and constructs”, Addison Wesley, 2nd Ed,1996.
3. Terrence W. Pratt , “Programming Languages” , Prentice Hall, 9th Ed,1996.
4. Michael L. Scott, “Programming Language Pragmatics” ,Elsevier, New Delhi,2009.
5. Thomson Learning, Kenneth .C. Louden, “Programming Languages: Principles And Practices” , 2nd Ed,2011.
6. Bjarne StroutStrup ,”Design and Evolution of C++”, Addison Wesley,1991.
7. James Gosling, “Java Programming Language “, Addison Wesley,2000.

CS010 706L01 : Real Time Systems
(Common to IT010 706L04 Real Time Systems)

Teaching scheme **Credits:** 4
2 hours lecture and 2 hour tutorial per week

Objectives

- *to learn , real-time operating systems, task scheduling, communication, fault tolerant techniques and , programming languages*

Module 1 (12 hours)

Introduction to Real Time Systems: Structure of real time systems, real time computer, task classes – Periodic, Aperiodic, critical, Non-critical, definition of real time systems – real time systems, embedded systems - Hard real time systems, soft real time systems, real time design issues.

Module 2 (12 hours)

Task Assignment and Scheduling: Uniprocessor scheduling algorithms –Rate monotonic Scheduling, Preemptive Earliest Deadline First (EDF), IRIS Tasks. Scheduling Aperiodic and Sporadic jobs in Priority Driven Sytems, Task Assignment-Utilization Balancing algorithm, Next Fit Algorithm for RM scheduling, Bin Packing for EDF, Myopic Offline Scheduling(MOS), Focused Addressing and Bidding, Buddy strategy. Fault Tolerant scheduling.

Module 3 (12 hours)

Communication – Communication Media and message sending topologies, network architecture issues, protocols – contention – based, token - based, stop and go multi loop, polled bus, hierarchal round robin, fault tolerant routing – clocks and synchronization– fault tolerant synchronization in hardware, synchronization in software.

Module 4 (12 hours)

Fault tolerance – definition, cause of failure, fault types, fault detection and containment, redundancy – hardware, software, time, information, integrated failure handling. Reliability Evaluation techniques- Obtaining parameter values, Reliability models for Hardware redundancy, software error models.

Module 5 (12 hours)

Programming Languages and Real Time databases – Desired language characteristics, Data Typing, Control Structures. Real time databases, characteristics, main memory databases, Transaction, Disk schedule algorithms, Databases for hard real time systems, maintaining serialization constituency.

References

1. Real Time Systems - C.M Krishna, Kang G. Shini (Tata McGraw Hill)
2. Real Time Systems- Jane W.S. Liu(Pearson)

CS010 706L02: DATA MINING AND DATA WAREHOUSING

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart an introduction to Data Mining.*
- *To develop basic knowledge of how data is transformed to Data Warehouses .*

Module I (12 hours)

Data Mining- Data Mining Funtionalities-Classification of Data Mining Systems-Data Mining Task Primitives- Major Issues in Data Mining
Data Preprocessing- Descriptive Data Summarization- Data Cleaning- Data Integration and Transformation- Data Reduction- Data Discretization and Concept Hierarchy Generation

Module II (14 hours)

Data Warehouse- A Multidimensional Data Model- Data Warehouse Architecture- Data Warehouse Implementation
Data Cube Computation and Data Generalization- Efficient methods for Data Cube Computation- Data Cube and OLAP Technology- Attribute Oriented Induction

Module III (10 hours)

Mining Frequent Patterns-Associations- Correlations-Basic Concepts-Efficient and Scalable Frequent Itemset Mining methods- Mining various kinds of Association Rules- From Association Mining to Correlation Analysis- Constraint Based Association Mining.

Module IV (12 hours)

Classification and Prediction- Issues regarding Classification and Prediction- Classification by Decision Tree Induction- Bayesian Classification – Rule Based Classification- Classification by Backpropagation- Support Vector Machines- Classification by Association Rule Analysis- Learning from Neighbors- Prediction- Accuracy and Error measures- Evaluating the accuracy of a Predictor- Ensemble methods- Model Selection.

Module V (12 hours)

Cluster Analysis- Types of Data in Cluster Analysis- Catagorization of Major Clustering methods- Partitioning methods- Hierarchical methods- Density based methods- Grid based methods- Model based Clustering methods- Clustering High Dimensional Data- Constraint based Cluster Analysis- Outlier analysis

Reference Books

1) Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, 2nd edtn. , Elsevier New Delhi 2010
2) Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining & OLAP Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008
3) Pieter Adriaans, Dolf Zantinge, Data Mining, Pearson Education Ltd., New Delhi, 2008
4) Thomas W Miller, Data and Text Mining, A Business Applications Approach, Pearson Education Ltd., New Delhi, 2008
5) Galit Shmueli, Nitin R. Patel, Peter C. Bruce, Data Mining for Business Intelligence, Wiley India Pvt. Ltd.,New Delhi 2009.

CS010 706L03: Operating System Kernel Design
(common to IT010 706L05 Operating System Kernel Design)

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To provide knowledge about the operating system working principles.*
- *To discuss most of the significant data structures and algorithms used in the kernel.*

Module I (13 hours)

Basic Operating System Concepts – Kernel – Types: monolithic, microkernel – An Overview of Unix Kernels-The Process/Kernel Model, Reentrant Kernels – Signals sending and receiving – System calls – System Call Handler and Service Routines - Interrupts and Exceptions - Interrupt Handling - The Timer Interrupt Handler.

Module II (13 hours)

Processes - Process Descriptor - Process State, Process relationship – Creating Processes - Process Termination - Process Scheduling – Scheduling algorithm – SMP Scheduler.
Kernel Synchronization - Synchronization Techniques - Process Communication - System V IPC.

Module III (10 hours)

Paging in Linux - Memory Management - Page Frame Management - The Buddy System Algorithm - The Process's Address Space - The Memory Descriptor - Memory Regions - Page Fault Exception Handler.

Module IV (14 hours)

Overview of the Unix File System - The Virtual File System - role of the VFS - VFS Data Structures – File system Mounting.
The Ext2 File system - Disk Data Structures - Creating the File system - Data Blocks Addressing - Allocating a Data Block.

Module V (10 hours)

Managing I/O Devices - Associating Files with I/O Devices - Device Drivers - Character Device - Block Device.
Disk Caches - Buffer Cache - Writing Dirty Buffers to Disk - Page Cache.

Reference Books

1) Daniel P. Bovet, Marco Cesati, *Understanding the Linux Kernel*, First ed., O'Reilly, 2000
2) M Bech et al., *Linux Kernel Internals*, 2nd ed., Addison-Wesley, 1998
3) Maurice J. Bach, *The Design of the Unix Operating System*, First Edition, Pearson Education, 1999.
4) Abraham Silberschatz, Peter B.Galvin and Greg Gagne, "*Operating System Concepts*", John Wiley & Sons Inc, 8th Edition 2010.

CS010 706L04 : Digital image processing

Teaching scheme **Credits:** 4
2 hours lecture and 2 hour tutorial per week

Objectives

- *To learn the image fundamentals and mathematical transforms necessary for image processing.*
- *To learn the image enhancement techniques and image restoration procedures.*
- *To learn the image segmentation and representation techniques.*

Module I (14 hours)

Digital image representation : Elements of digital image processing systems - Image digitizers & scanners - Elements of visual perception - Brightness & contrast - colour perception & processing - pixel based transformation – geometric transformation – image file formats
Image sampling & Quantization - Two dimensional Sampling theorem - Reconstruction of image from its samples – Aliasing

Module II (14 hours)

Image Transforms : Two dimensional DFT & its properties - Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar, Slant, and Karhunen – Loeve transforms

Module III (10 hours)

Image Enhancement : Point processing - Histogram processing - Spatial Filtering – image subtraction - image averaging - Enhancement in the frequency domain - colour Image processing.

Module IV (12 hours)

Image Restoration : Degradation model – Diagonalization of circulant matrices - Inverse filtering - Wiener filter methods – Constrained least mean square filtering
Image Coding & Compression- basic principles Image compression: Run length coding , predictive coding ,Basics of Image compression standards:

Module V (10 hours)

Image analysis : Segmentation – Thresholding – point, line and edge detection – Boundary detection - Region Based segmentation - image reconstruction – radon transform – projection theorem – convolution filter back projection - Fourier reconstruction method – applications of image processing.

References

1. Rafael C. Gonzalez - Richard E. Woods, *Digital Image Processing*, Pearson Education
2. Dutta Majumdar - *Digital Image Processing and Applications,* PHI
3. Madhuri A. Joshi – Digital Image Processing,PHI, New Delhi,2010
4. Anil K. Jain - Fundamentals of Digital Image processing," Prentice Hall India, 1989.
5. William K. Pratt - Digital Image Processing, John Wiley and sons, New delhi, 2010.
6. S.Jayaraman, S. Esakkiarajan. T. Veerakumar- Digital Image Processing,TMH,New Delhi, 2010.
7. Rosenfield and A. C. Kak - Digital Picture Processing, 2nd edition, Vols. 1 & 2,
    a. Academic Press, New York, 1982.

CS010 706L05: DATA PROCESSING AND FILE STRUCTURES

Teaching scheme

Credits: 4

2 hours lecture and 2 hour tutorial per week

Objectives

- *To develop an understanding about basic concepts of data processing in mainframe system.*
- *To enable the students to learn the detailed features of COBOL, database concepts.*

Module I (10 hours)

Introduction to mainframe system

Introduction—Evolution of Mainframe Systems, Introduction to COBOL & JCL, COBOL/JCL Relation ,Compiling and Linking Programs in Mainframes, VSAM—VSAM Data Sets—Mainframes Operating Systems(over view), z/OS , OS/2 , MVS --Features

Module II (14 hours)

Programming Concept

Mainframe P**rogramming**—Introduction to COBOL, Structure of COBOL Programs, COBOL words, Identification and Environment Division, Configuration Section, Input-output Section, Data Division, Level Structure— File section, Assign to clause, Working Storage section-Editing, Special-names paragraph, Usage clause—Synchronized, Justified, Redefines, Renames clauses

Module III (11hours)

Data Processing Concept

Procedure division—Data movement, Arithmetic, Sequence control , Input/Output Conditional verbs, Group moves, Compute verb, Conditions, Table handling, Occur clause—Perform verb, Set verb, Writing simple COBOL programs

Module IV (14 hours)

File Handling in Mainframes

File types — Sequential, Direct, Indexed files, Using Files in COBOL Programs, File Manipulation Verbs, **JCL Basics**—Writing to disk, DSN, DISP, Unit, Space, DCB Parameters, Job statement and Parameters –Positional and keyword Parameters, EXEC statement, EXEC Parameters, Concept of Compile and Run JCL s.

Module V (11 hours)

DataBase Concepts

Introduction to DB2—Relational DBMS Concept, Writing DB2/COBOL programs, Compilation and Binding of DB2 Programs , Concepts of DBRM, Bind JCL, Introduction

to CICS – Case study (library information system in COBOL/JCL/DB2—to be taken along with all modules as example)

Reference Books

1. M K Roy, D Ghosh Dastidar ,*Cobol Programming* ,Tata McGraw Hill,New Delhi,1999,Second Edition
2. M K Roy, D Ghosh Dastidar ,*Cobol Programming : problems & Solutions*, Tata McGraw Hill, New Delhi
3. Saba Zamir**,** Chander Ranade ,*The MVS JCL Primer (J Ranade IBM Series)*, McGraw-Hill
4. C.J. date, Colin J White, *A Guide to DB2*, Pearson Education , New Delhi,4th Edition, 2006.
5. Craig S. Mullins, *DB2 Developers Guide*, Pearson education , New Delhi, 5th Edition,2008
6. Andreas S Philippakis, Leonard J Kazmier ,*Information System through COBOL*, McGraw-Hill

CS010 706L06 CLIENT SERVER ARCHITECTURE AND APPLICATIONS

Teaching scheme **Credits:** 4
2 hours lecture and 2 hour tutorial per week

Objectives

- *To impart an introduction Client-Server system.*
- *To develop basic knowledge on securing Client-Server system.*
- *To have exposure to applications of Client-Server system.*

Pre-requisites: *Computer Networks and Operating Systems*

Module I (10 hours)

Introduction: History-uses-Client Server Computing& Heterogeneous Computing Cross Platform Computing Distributed Computing - The costs of Client Server Computing - Advantages and Disadvantages - Client Server Databases.

Module II (12 hours)

Design: Fundamentals of client server design - Managing the interaction of client and server - Communications Techniques protocols & Client server interaction protocols - Preparing applications for client server - Optimizing applications for client server - Example client server implementations - Request acceptance dispatching - Execution of requests - Client server interaction using message.

Module III (14 hours)

Multitasking: Multi programming vs multitasking - Processor - Advantages and draw backs of multiple processor - Child and parent processor - Case study Novell Netware and Windows NT - Developing server applications - Threads - Server communication model.

Module IV (12 hours)

Synchronization: Scheduling implementations - processing queues - context switching pre-emptive systems - critical sections - mutual exclusion - semaphores – semaphore implementations in NT & Netware

Module V (12 hours)

Communications: Network communication - Inter process communication - Building portable client server applications - Introduction to Client/server security concepts- Secure client/server communications – password security at system level and application level

Reference Books

1. Jeffrey D.Schank, *" Novell's Guide to Client-Server Application & Architecture"* Novell Press.
2. Robert Orfali,Dan Harkey, Jeri Edwards,"Clien/Server Survival Guide",Wiley-India Edition,Third Edition,2007
3. Dawna Travis Dewire, "*Client Server Computing*", McGraw Hill
4. W.H.Inman,*"Developing Client Server Applications"* , BPB
5. Joe Salemi, "*Guide to Client Server Databases*", BPB.
6. David Vaskevitch, "*Client Server Strategies*",Galgotia.
7. Peter T.Davis, "Securing Client/Server Computer Networks", McGraw Hill
8. Subhash Chandra Yadav, Sanjay Kumar Singh,"An Introduction to Client/Server Computing", New Age International Publishers,2009

CS010 707: Systems Programming Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To familiarize the design of all phases of compilers up to a stage of intermediate code generation.*
- *To enable the students to design and implement modern compilers for any environment.*

Section 1 (Compiler Design)

1. Design of a Lexical Analyzer using Finite Automation (including Symbol table)
(The program should be designed for a specific number of keywords, identifiers, numbers,
operators, punctuators etc. Finite automata should be designed for each type of token)
2. Design of lexical analyzer using LEX
3. Design of recursive descent and LL (1) parsers (including syntax tree)
(The programme should be designed for a subset of PL features (For example Arithmetic
expressions with operators +, -, *, /, ↑ etc)
4. Implementation of Operator precedence Parsing (including syntax tree)
5. Design of parser for arithmetic expressions using YACC
6. Design of a simple type checker (For eg for the primitive types of C)
7. Generation of IC for arithmetic expressions
8. Simple code optimization strategies (For example Constant folding, Loop invariant elimination, common sub expression elimination etc)
9. Design of a code generator for arithmetic expressions using Expression tree
(The program should take a set of IC as the input and produce the target code for some
machine such as Intel 8086 Microprocessor)
10. Writing a simple Compiler for a subset of Language features

Section 2:-

1.Design of 2-Pass Assembler(The Program should be designed for the generation for machine code of any simple processor such as Intel 8005)
2.Design of Absolute Loader
3.Design of Macro Pre-processor(The program should be designed for a simple preprocessor such as the # define in C)

4 Design of Device Drivers (Implementation of Simple Device Drivers such as one for the PC Speaker.)

Remark:

At Least 8 experiments from Section 1 and 2 experiments from section

CS010 708: Networking Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To provide experience on design, testing, and analysis of Java Programs.*
- *To acquaint the students with the Networking Protocols and Communication using ports and sockets.*

1) Basic Java Programming
2) Programs to create Applets
3) Programs to create Graphic User Interfaces
4) Programs to implement Client and Server Sockets
5) Programs for Chatting using TCP and UDP
6) Programs for Remote Procedure Call
7) Programs for Remote Method Invocation
8) Programs to interface with XML
9) Programs to implement Sliding Window Protocols
10) Programs for Multicasting
11) Programs to interface with Databases
12) Programs for Image Processing
13) Programs in Perl and PHP
14) Programs to create Dynamic Web Pages

Any experiment according to the syllabus of CS010 602 Internet Computing, CS010604 Computer Networks, CS010701 Web Technologies may be substituted subjected to permission from competent authority.

CS 010 709 Seminar

Teaching scheme **credits: 2**

2 hours practical per week

The seminar power point presentation shall be fundamentals oriented and advanced topics in the appropriate branch of engineering with references of minimum seven latest international journal papers having high impact factor.

Each presentation is to be planned for duration of 25 minutes including a question answer session of five to ten minutes.

The student's internal marks for seminar will be out of 50. The marks will be awarded based on the presentation of the seminar by the students before an evaluation committee consists of a minimum of 4 faculty members. Apportioning of the marks towards various aspects of seminar (extent of literature survey, presentation skill, communication skill, etc.) may be decided by the seminar evaluation committee.

A bona fide report on seminar shall be submitted at the end of the semester. This report shall include, in addition to the presentation materials, all relevant supplementary materials along with detailed answers to all the questions asked/clarifications sought during presentation. All references must be given toward the end of the report. The seminar report should also be submitted for the viva-voce examination at the end of eighth semester.

For Seminar, the minimum for a pass shall be 50% of the total marks assigned to the seminar.

CS 010 710 Project Work

Teaching scheme **credits: 1**

1 hour practical per week

Project work, in general, means design and development of a system with clearly specified objectives. The project is intended to be a challenge to intellectual and innovative abilities and to give students the opportunity to synthesize and apply the knowledge and analytical skills learned in the different disciplines.

The project shall be a prototype; backed by analysis and simulation etc. No project can be deemed to be complete without having an assessment of the extent to which the objectives are met. This is to be done through proper test and evaluation, in the case of developmental work, or through proper reviews in the case of experimental investigations.

- The project work has to be started in the seventh semester and to be continued on to eighth semester.
- Project work is to be done by student groups. Maximum of four students only are permitted in any one group.
- Projects are expected to be proposed by the students. They may also be proposed by faculty member (Guide) or jointly by student and faculty member.
- Students are expected to finalise project themes/titles with the assistance of an identified faculty member as project guide during the first week of the seventh semester.

The progress from concept to final implementation and testing, through problem definition and the selection of alternative solutions is monitored. Students build self confidence, demonstrate independence, and develop professionalism by successfully completing the project.

Each student shall maintain a project work book. At the beginning of the project, students are required to submit a project plan in the project book. The plan should not exceed 600 words but should cover the following matters.

- ❖ Relevance of the project proposed
- ❖ Literature survey
- ❖ Objectives
- ❖ Statement of how the objectives are to be tackled

- Time schedule
- Cost estimate

These proposals are to be screened by the evaluation committee (EC- minimum of 3 faculty members including the guide) constituted by the head of department, which will include a Chairman and the EC will evaluates the suitability and feasibility of the project proposal. The EC can accept, accept with modification, request a resubmission, or reject a project proposal.

Every activity done as part of project work is to be recorded in the project book, as and when it is done. Project guide shall go through these records periodically, and give suggestions/comments in writing in the same book.

The students have to submit an interim report, along with project work book showing details of the work carried out by him/her and a power point presentation at the end of the 7^{th} semester to EC. The EC can accept, accept with modification, request a resubmission, or extension of the project.

The student's internal marks for project will be out of 50, in which 30 marks will be based on day to day performance assessed by the guide. Balance 20 marks will be awarded based on the presentation of the project by the students before an evaluation committee consists of a minimum of 3 faculty members including the guide.

For Project, the minimum for a pass shall be 50% of the total marks assigned to the Project work.

CS010 801 : HIGH PERFORMANCE COMPUTING

Teaching scheme **Credits:** 4
3 hours lecture and 2 hour tutorial per week

Objectives

- *To design a powerful and cost-effective computer system.*
- *To provide the basic concepts of parallel processing on high performance computers.*

Module I (15 hours)
Introduction to parallel processing - Trends towards parallel processing - Parallelism in uniprocessor - Parallel computer structures-Architecture classification schemes ,Amdahl's law,Indian contribution to parallel processing

Module II (15 hours)
Principles of pipelining and vector processing - Linear pipelining - Classification of pipeline processors - General pipelines - Instruction and Arithmetic pipelines –Design of Pipelined instruction unit-Principles of Designing Pipeline Processors- Instruction prefetch and branch handling- Data Buffering and Busing Structure-Internal forwarding and register tagging-Hazard detection and Resolution,Dynamic pipelines and Reconfigurability

Module III (15 hours)
Array processors - SIMD array processors - Interconnection networks - Static vs dynamic networks - mesh connected networks - Cube interconnection networks - Parallel algorithms for array processors - SIMD matrix multiplication-Parallel sorting on array processors - Associative array processing - Memory organization.

Module IV (15 hours)
Multiprocessor architectures and Programming - Loosely coupled and Tightly coupled multiprocessors - Interconnection networks - Language features to exploit parallelism -Inter process communication mechanism-Process synchronisation mechanisms,synchronization with semaphores.

Module V (15 hours)
Dataflow computers - Data driven computing and Languages, Data flow computers architectures - Static data flow computer , Dynamic data flow computer ,Data flow design alternatives.

References:

1.Computer Architecture & Parallel Processing - Kai Hwang & FayeA.Briggs,McGraw Hill

2. Computer architecture A quantitative approach - John L Hennessy and David A. Patterson-ELSEVIER,Fourth Edition

3. Elements of Parallel computing - V. Rajaraman - PHI

4. Super Computers - V. Rajaraman - Wiely arstern

5. Parellel Processing for Super Computers & AI Kai Hwange & Douglas Degneot Mc Graw Hill

6. Highly parallel computing - George S. Almasi,Allan Gottlieb. - Benjamin Cumings Publishers.

7. HIgh Performance Computer Architecture - Harold S. Stone, Addison Wesley.

8. Advanced Computing- Vijay P.Bhatkar, Asok V.Joshi, Arirban Basu, Asok K.Sharma.

CS010 802: ARTIFICIAL INTELLIGENCE

Teaching scheme **Credits:** 4
2 hours lecture and 2 hour tutorial per week

Objectives

- *To provide introduction to the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence.*
- *To familiarize with Fuzzy Logic and knowledge processing in expert systems*
- *To give exposure to problem solving in AI using Python*

Module 1 (14 hours)

Problems- problem spaces and search, production systems, Problem characteristics, Searching strategies – Generate and Test, Heuristic Search Techniques- Hill climbing– issues in hill climbing, General Example Problems.
Python-Introduction to Python- Lists Dictionaries & Tuples in Python- Python implementation of Hill Climbing

Module 2 (12 hours)
Search Methods- Best First Search- Implementation in Python- OR Graphs, The A * Algorithm, Problem Reduction- AND-OR Graphs, The AO* algorithm, Constraint Satisfaction. Games as search problem, MINIMAX search procedure, Alpha–Beta pruning.

Module3 (12 hours)
Knowledge representation -Using Predicate logic- representing facts in logic, functions and predicates, Conversion to clause form, Resolution in propositional logic, Resolution in predicate logic, Unification, Question Answering, forward and backward chaining.

Module 4 (12 hours)
Learning- Rote Learning – Learning by Advice- Learning in Problem Solving - By Parameter Adjustment with Macro Operators, Chunking, Learning from Examples- Winston's Learning Program, Version Spaces- Positive & Negative Examples – Candidate Elimination- Decision Trees- ID3 Decision Tree Induction Algorithm.

Module 5 (10 hours)
Fuzzy Sets – Concept of a Fuzzy number- Operations on Fuzzy Sets – Typical Membership Functions – Discrete Fuzzy Sets.
Expert System –Representing and using Domain Knowledge – Reasoning with knowledge– Expert System Shells –Support for explanation- examples –Knowledge acquisition-examples.

References

1. Elaine Rich, Kevin Knight, Shivashankar B Nair
Tata McGraw Hill- Artificial Intelligence, 3rd Edn ,2004.
2. Stuart Russell – Peter Narang, Pearson Education Asia - Artificial Intelligence- A modern approach.
3. George F Luger - Artificial Intelligence, Pearson Education Asia
4. Allen B. Downey – (Think Python) Python for software design- How to think like a computer scientist, Cambridge University press, 2009 .

Web Reference

1. http://code.google.com/p/aima-python/ - Website for search strategy implementation in python

CS010 803: Security in Computing

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart an essential study of computer security issues*
- *To develop basic knowledge on cryptography*
- To impart an essential study of various security mechanisms

Module 1 (12 hours)

Introduction: Security basics – Aspects of network security – Attacks Different types –Security attacks -Security services and mechanisms.
Cryptography: Basic Encryption & Decryption – Classical encryption techniques – symmetric encryption, substitution ciphers – Caesar cipher – Monoalphabetic Cipher, Playfair Cipher, Polyalphabetic cipher - Vigenère – Cipher, Transposition ciphers - Rail Fence cipher, Row Transposition Ciphers.

Module 2 (12 hours)

Modern Block Ciphers - Fiestel Networks , DES Algorithm – Avalanche Effect.
Introduction to Number Theory - Prime Factorisation, Fermat's Theorem, Euler's Theorem, Primitive Roots, Discrete Logarithms.
Public key Cryptography:- Principles of Public key Cryptography Systems, RSA algorithms-Key Management – Diffie-Hellman Key Exchange, Elliptic curve cryptography.

Module 3 (12 hours)

Message Authentication-Requirements- Authentication functions- Message authentication codes-Hash functions- Secure Hash Algorithm, MD5, Digital signatures- protocols- Digital signature standards, Digital Certificates.
Application Level Authentications- Kerberos, X.509 Authentication Service, X.509 certificates.

Module 4 (12 hours)

Network Security: Electronic Mail Security, Pretty Good Privacy, S/MIME, IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.
Web Security: Web Security considerations- Secure Socket Layer -Transport layer Security-Secure electronic transaction. Firewalls-Packet filters- Application Level Gateway- Circuit Level Gateway.

Module 5 (12 hours)

Operating System Security: Memory and Address Protection, Control of Access to General Objects, File Protection Mechanisms, Models of Security – Bell-La Padula Confidentiality Model and Biba Integrity Model.
System Security: Intruders, Intrusion Detection, Password Management, Viruses and Related Threats, Virus Countermeasure.

Reference Books

1. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, Fourth Edition, 2006.
2. Charles P. Pfleeger, “Security in Computing”, Pearson Education, Third Edition, 2005.
3. Behrouz A. Forouzan, Dedeep Mukhopadhyay “Cryptography & Network Security”, Second Edition,Tata McGraw Hill, New Delhi, 2010.
4. Andrew S. Tanenbaum, “Modern Operating Systems”, Pearson Education, Second Edition, 2002.
5. Atul Kahate, “Cryptography and Network Security”, Second Edition, Tata McGraw Hill
6. Wenbo Mao, “ Modern Cryptography- Theory & Practice”, Pearson Education, 2006.
7. Bruce Schneier, “Applied Cryptography”, John Wiley and Sons Inc, 2001.

CS010 804L01: E-COMMERCE

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart an introduction to Elecronic Commerce.*
- *To develop basic knowledge of Business in Internet and Electronic Payment.*

Module I (12 hours)
Introduction to Electronic Commerce:- E-Commerce Framework, Anatomy of E-Commerce Applications, E-Commerce Consumer & Organization Applications. **E-Commerce and World Wide Web** – Internet Service Providers, Architectural Framework for Electronic Commerce, WWW as the Architecture, Hypertext publishing.

Module II (14 hours)
Network Security:- Client-Server Network Security, CS Security Threats, Firewalls, Data & Message Security, Encrypted Documents, Security on the Web.
Consumer Oriented Electronic Commerce:- Consumer Oriented Applications, Mercantile Process Models, Mercantile Models from the Consumer's Perspective, Mercantile Models from the Merchant's Perspective

Module III (10 hours)
Electronic Payment Systems :- Types of Electronic Payment Systems, Digital Token Based Electronic Payment System, Smart Cards, Credit Cards, Risk in Electronic Payment Systems, Designing Electronic Payment Systems.

Module IV (12 hours)
Electronic Data Interchange:- EDI Application in Business, EDI-Legal, Security and Privacy Issues, EDI standardization, EDI Envelope for Message Transport, Internet based EDI, Internal Information System, Work-flow Automation and Coordination, Supply Chain Management, Document Library, Types of Digital Documents, Corporate Data Warehouses.

Module V (12 hours)
Recent Trends in E-Commerce:- Multimedia in E-Commerce, Video Conferencing with Digital Videos, Broad Band Telecommunication, Frame & Cell Relays, Switched Multimegabit Data Service (SMDS), Asynchronous Transfer Mode, Mobile Computing and Wireless Computing.

Reference Books

1) Ravi Kalakota, Andrew B Whinston, Frontiers of Electronic Commerce, Pearson Education Inc., New Delhi, 2009
2) Ravi Kalakota, Andrew B. Whinston, Electronic Commerce A Manager's Guide, Pearson Education Inc., New Delhi, 2007
3) P. T. Joseph, E-Commerce An Indian Perspective, PHI Learning Private Limited, New Delhi, 2009

CS010 804L02: GRID COMPUTING
(Common to IT010 804L06:Grid Computing)

Teaching scheme **Credits:** 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To impart an introduction to Grid Computing.*
- *To develop basic knowledge about the Open Grid Service Architecture.*

Module I (12 hours)

Grid Computing – Introduction- Grid Activities- Overview of Grid Business Areas- Grid Applications- Grid Infrastructure.

Module II (12 hours)

Grid Computing Organizations and their roles- Grid Computing Anatomy- Grid Problem- Concept of Virtual Organizations- Grid Architecture- Autonomic Computing- Business on Demand and Infrastructure Virtualization- Semantic Grids.

Module III (12 hours)

Merging the Grid Services Architecture- Service Oriented Architecture- Web Service Architecture- XML relevance to Web Services- Service Message Description Mechanisms- Relationship between Web Service and Grid Service.

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Module IV (12 hours)

Open Grid Services Architecture- OGSA Platform Components- Open Grid Services Infrastructure- Introduction to Service Data Concepts- Grid Service- OGSA Basic Services- Common Management Model- Policy Architecture- Security Architecture.

Module V (12 hours)

Grid Computing Toolkits- GLOBAS GT3 Toolkit Architecture- GLOBAS GT3 Toolkit Programming Model- GLOBAS GT3 Toolkit High Level Services.

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Reference Books

1) Joshy Joseph, Craig Fellenstein, Grid Computing, Pearson Education Inc, New Delhi 2004.
2) D Janakiram, Grid Computing A research Monograph, Tata McGraw-Hill Publishing Company Limited New Delhi, 2005.

CS010 804L03: Bioinformatics

Teaching scheme Credits: 4

2 hours lecture and 2 hour tutorial per week

Objectives

- *To understand the science of storing, extracting, organizing, analysing and interpreting biological data.*

Module 1 (12 hours)

Basic Concepts of Molecular Biology: Cells - Chromosomes, DNA, RNA, Proteins,
Central dogma of molecular biology, RNA classification – coding and non coding RNA-mRNA, tRNA, miRNAand sRNA , Genomes and Genes - Genetic code, ORFs,Slice varients,Transcription ,Translation and Protein synthesis.

Module 2 (12 hours)

Sequence alignments – - local/global, pairwise/multiple Sequence alignment- Smith-Waterman algorithm, NeedlemanWunch algorithm, Multiple sequence alignment –Sum-of-Pairs measure - Star and tree alignments ,Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM ,Phylogenetic Trees

Module 3 (12 hours)

Informational view of Genomic data, Gene expression, Microarrays-cDNA arrays,Oligo Arrays, Data analysis methodologies-Normalization,Principal Componenet Analysis,Clustering-Hierarchical,K-meana,FCM,Application of Microarrays.
Gene regulation, Gene Ontology, metabolic pathways, and gene set enrichment analysis.

Module 4 (12 hours)

Evolution of Protein Structures, Classification of Protein Structures- primary,secondary,ternary and quatenary,Protein Structure prediction and modeling, Assignment of protein structures to genomes, Prediction of protein function, Protein folding problem, Protein Threading, Drug discovery and development

Module 5 (12 hours)

Biological data bases: Pubmed,Swissport,EMBL,DDBJ,Genbank,
Software Tools: Use of Tools for basic and specialized sequence processing such as: BLAST, FASTA, RasMol, Phylip, ClustalW

References

1. Setubal & Meidanis, “Introduction to Computational Molecular Biology”, Brooks/Cole Cengage Learning 2009.
2. Arthur M Lesk, “Introduction to Bioinformatics”, Oxford University Press, India, 2004
3.Vittal R. Srinivas “Bioinformatics a mordern Approach”,PHI Learning 2009 .
4.Shuba Gopal,Rhys Price Jones,Paul Thymann,Anne Haake,”Bioinformatics with fundamentals of Genomics and proteomics, Tata McGraw Hill
3.Zoe Lacroix,Terence Critchlow “Bioinformtics managing scientific Data”,Morgan Koufmann Publishers
4.B.G Curran,R J walker,SC Bhattia”Bioinformatics”,CBS Publishers,2010
5.Harshawardhana P. Bal “Bioinformatics Principles and Applications”,Tata MacGraw Hill

CS010 804L04 :Optimization Techniques

Teaching Schemes **Credits: 4**

2 hours lecture and 2 hour tutorial per week.

Objectives:

- *To understand the need and origin of the optimization methods.*
- *To get a broad picture of various applications of optimization methods used in engineering.*
- *To define an optimization problem and its various components.*

Module I (12 Hrs)

One Dimensional Unconstrained Minimization techniques, single variable minimization, unimodality, bracketing the minimum, necessary and sufficient conditions for optimality, convexity, steepest descent method.

Module II (12Hrs)

Linear programming, introduction, linear programming problem, linear programming problems involving LE (?) constraints, simplex method, optimality conditions, artificial starting solutions, the M method.

Module III (12hrs)

Transportation models, definition, non traditional models, transportation algorithm, East West corner method, Vogel approximation method. Assignment model, Introduction, Hungarian method.

Module IV (12Hrs)

Forecasting Models, moving average technique, regression method, exponential smoothing. Game Theory, two persons zero sum games, mixed strategy games-graphical method.

Module V (12Hrs)

Queuing models, elements of queuing model, pure birth and death model, specialized Poisson queues, single server models. Multiple server models, self service model.

References:

1. Ashok D Belegundu, Tirupathi R Chandrupatla, optimization concepts and Application in Engineering, pearson Education.
2 Kalynamoy Deb, “Optimization for Engineering Design, Alogorithms and Examples”, Prentice Hall,
3. Hamdy A Taha, “Operations Research – An introduction”, Pearson Education,
4. Hillier / Lieberman, “Introduction to Operations Research”, Tata McGraw Hill Publishing company Ltd,
5. Singiresu S Rao, “Engineering optimization Theory and Practice”, New Age International,
6. Mik Misniewski, “Quantitative Methods for Decision makers”, MacMillian Press Ltd.

CS010 804L05: MOBILE COMPUTING

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To study the relevance and underlining infrastructure of multimedia system.*
- *To enable the students to apply contemporary theories of multimedia learning to the development of multimedia products.*

Module I (10 hours)
Introduction to wireless communication system:- 2G cellular network,2G TDMA Standards,3G wireless networks,wireless local loop and LMDS, Broadcast Systems-Broadcast transmission, Digital Audio Broadcasting-Multimedia Object Transfer Protocol. Digital Video Broadcasting.
Cellular concepts-channel assignment strategy-hand off strategy-interface and system capacity-trunking –improving coverage and capacity in cellular system.

Module II (12 hours)
Wireless Communication Systems:-Telecommunication Systems-GSM-GSM services & features,architecture,channel type,frame structure,signal processing in GSM & DECT-features & characteristics,architecture,functional concepts & radio link,personal access communication system(PACS)-system architecture-radio interface,
Protocols.Satellite Systems-GEO, LEO, MEO.

Module III (11 hours)
Wireless LAN and ATM:- Infra red and Radio Transmission, Infrastructure and ad hoc networks ,802.11- Bluetooth- Architecture, Applications and Protocol, Layers, Frame structure. comparison between 802.11 and 802.16.

Wireless ATM- Services, Reference Model, Functions, Radio Access Layer. Handover-Reference Model, Requirements, Types, handover scenarios.
Location Management, Addressing, Access Point Control Protocol (APCP).

Module IV (14 hours)
Mobile Network and Transport Layers:- Mobile IP- Goals, Requirements, IP packet delivery, Advertisement and discovery. Registration, Tunneling and Encapsulation, Optimization, Reverse Tunneling, IPv6, Dynamic Host configuring protocol, Ad hoc networks – Routing, DSDV, Dynamic source routing. Hierarchical Algorithms.
Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transmission.

Module V (13 hours)
Wireless Application Protocol & World Wide Web
WAP- Architecture, Protocols-Datagram, Transaction, Session.-Wireless Application Environment-WML- Features, Script- Wireless Telephony Application.
WWW- HTTP, Usage of HTML, WWW system architecture.

References

1. Jochen Schiller “Mobile Communications “ , Preason Education Asia
2.Wireless communications Principles and practice-second edition-Theodore S.Rappaport,PHI,Second Edition ,New Delhi, 2004

3. Computer Networks – Andrew S. Tanenbaum , PHI

4.. Communication Networks -Fundamental Concepts and Key Architectures Leon-Garcia & Indra Widjaja, Tata McGraw Hill

CS010 804L06 : Advanced Networking Trends

Teaching scheme **Credits:** 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To acquaint the students with the application of networking.*
- *To understand the variousTCP/IP protocols and the working of ATM and its performance, Network security and authentication, and variousalgorithms related to it has been dealt, to get a practical approach ,advanced topics in the design of computer networks and network protocols*

Module 1 (12 hours)

Ethernet Technology – Frame format – Interface Gap – CSMA/CD – 10 mbps Ethernet, Fast Ethernet, Gigabit Ethernet, Wire
less Ethernet.

ISDN - Definition - Protocol architecture - System architecture - Transmission channels - ISDN interface, B-ISDN.

Module 2 (12 hours)

ATM – ATM Principles – BISDN reference model – ATM layers – ATM adaption Layer – AAL1, AAL2, AAL3/4, AAL5 – ATM addressing – UNI Signaling – PNNI Signaling

Module 3 (12 hours)

Wireless LAN – Infrared Vs Radio transmission – Infrastructure & ad hoc n/w – IEEE 802.11 – Physical Layer – MAC layer.
Bluetooth – Physical Layer – MAC layer – Networking - Security

Module 4 (12 hours)

Mesh Networks- Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture –Opportunistic Routing – Self Configuration and Auto Configuration - Capacity Models –Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks

Module 5 (12 hours)

Sensor Networks- Introduction – Sensor Network architecture – Data Dissemination – Data Gathering –MAC Protocols for sensor Networks – Location discovery – Quality of Sensor Networks– Evolving Standards – Other Issues – Recent trends in Infrastructure less Networks

References

1. An introduction to Computer Networking - Kenneth C Mansfield, Jr., James L. Antonakos, PHI
2. Communication Networks Fundamental Concepts & Key Architecture - Leon-Garcia – Widjaja, Tata McGraw Hill
3. Mobile Communication - Jochen Schiller, Pearson Education Asia
4. C. Siva Ram Murthy and B.S.Manoj, “Ad hoc Wireless Networks – Architectures and Protocols’, Pearson Education, 2004
5. C.K.Toh, “Adhoc Mobile Wireless Networks”, Pearson Education, 2002.

CS010 805G01: MULTIMEDIA TECHNIQUES

Teaching scheme **Credits:** 4
2 hours lecture and 2 hours tutorial per week

Objectives

- *To study the relevance and underlining infrastructure of multimedia system.*
- *To enable the students to apply contemporary theories of multimedia learning to the development of multimedia products.*

Module I (10 hours)
Multimedia Basics: Multimedia and Hypermedia, Multimedia Software, Editing and Authoring Tools, VRML.
Graphics and Image Data Representation— Graphics/Image Data Types, Popular File Formats.
Concepts in Video and Digital Audio— Color Science, Color Models in Images, Color Models in Video. Types of Video Signals, Digitization of Sound, MIDI - Musical Instrument Digital Interface, Quantization and Transmission of Audio.

Module II (12 hours)
Lossless & Lossy Compression Algorithms— Introduction, Basics of Information Theory, Run-Length Coding, Variable-Length Coding, Dictionary-Based Coding, Arithmetic Coding, Lossless Image Compression. Distortion Measures, The Rate-Distortion Theory, Quantization, Transform Coding, Wavelet-Based Coding, Wavelet Packets, Embedded Zerotree of Wavelet Coefficients, Set Partitioning in Hierarchical Trees (SPIHT).

Module III (11 hours)
Image, Video and Audio Compression — Image Compression -JPEG , JPEG-LS.
Basic Video Compression Techniques - Introduction to Video Compression, Video Compression Based on Motion Compensation, MPEG
Video Coding— Audio Compression Techniques-—MPEG, ADPCM in Speech Coding, Vocoders, Psychoacoustics, Audio Codecs.

Module IV (14 hours)
Storage and Retrieval of Images — Content-Based Retrieval in Digital Libraries: Image retrieval, CBIRD. A Case Study, Image Search Systems, Quantifying Results, Querying on Videos, Querying on Other Formats, Outlook for Content-Based Retrieval.
Image Databases— Raw Images, Compress Image Presentations, Image Processing Segmentation, Similarity- Based Retrieval, Alternating Image DB Paradigms, Representing Image DBs with Relations and R Trees, Retrieving Images by Special Layout, Implementations, Selected Commercial Systems.

Module V (13 hours)
Multimedia Databases
Text/Document Databases— Precision and Recall, Stop Lists, Word Stems and Frequency tables, Latent Semantic Indexing, TV-Trees, Other Retrieval Techniques.
Multimedia Databases—Design and Architecture of a Multimedia Database, Organizing Multimedia Data based on the Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data , Indexing SMDSs with Enhanced Inverted Indices, Query Relaxation/ Expansion.

References

1. .Ze-Nian Li and M. S. Drew, .*Fundamental of Multimedia*., Pearson Education,2004
2. V. S. Subrahmanian, .*Principles of Multimedia Database Systems*., Morgan Kaufmann Publication.
3. K. R. Rao, Zoran S. Bojkovic, D. A. Milovanovic, .*Introduction to Multimedia Communications.*, Wiley.
4. R. Steinmetz and K. Nahrstedt .*Multimedia: Computing, Communication & Applications*, Pearson Education.
5. Buford, .*Multimedia Systems*., Pearson Education.
6. C. T. Bhunia, .*Multimedia and multimedia Communications*., New Age International Publishers.
7. Prabhat K. Andheigh, Kiran Thakrar, *Multimedia Systems design*., PHI.
8. Koegel Buford, *Multimedia Systems*., Pearson Eduaction.
9. J. D. Gibson, .*Multimedia Communications: Directions and Innovations.*, Academic
10. Press, Hard-court India.

CS010 805G02 :Neural networks
(Common to IT010 805G05 Neural Networks)

Teaching scheme Credits: 4

2 hours lecture and 2 hours tutorial per week

Objectives

To understand the fundamental building blocks of Neural networks

Module 1 (14 hours)

Biological Neurons and Neural Networks, Basic Structures and Properties of Artificial Neural Networks, Basic Neuron Models-McCulloch-Pitts -Nearest Neighbour- Radial Basis Function, Activation Functions ,Singe Layer Perceptrons-Linear Seperability, Learning and Generalization in Single Layer Perceptron-Hebbian Learning-Gradient Descent Learning-Widrow-Hoff Learning-The Generalized Delta rule, Practical Considerations

Module 2 (12 hours)

Multi Layer Perceptron Learning,Back Propogation Algorithim -Applications – Limitations– Network Paralysis – Local Minima – Temporal Instability, Pattern Analysis Tasks- Classification- Regression- Clustering, Pattern Classification and Regression using Multilayer Perceptron.

Module 3 (10 hours)

Radial Basis Function Networks: Fundamentals, Algorithms and Applications, Learning with Momentum, Conjugate Gradient Learning, Bias and Variance. Under-Fitting and Over-Fitting, Stochastic neural networks, Boltzmann machine.

Module 4 (12 hours)

Network based on competition:- Fixed weight competitive Network-Maxnet, Mexican Hat and Hamming Net, Counter Propagation Networks- Kohonen's self-organizing map – Training the Kohonen layer – Training the Grossberg layer – Full counter propagation network – Application, Adaptive resonance theory – classification- Architecture – Learning and generalization.

Module 5 (12 hours)

Pattern Association: - training algorithm for pattern association - Hetro Associative Network, Auto Associative Network, Architecture of Hopfield nets – stability analysis ,General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM training algorithms.

References

1. B. Yegnanarayana, "Artificial Neural Networks", PHI.
2. Simon Haykin, Neural Networks, 2/e, Prentice Hall
3. Neural Computing & Practice – Philip D. Wasserman
4. Neural Networks in Computer Intelligence-Limin Fu,Tata Mc.Hill Edition

CS010 805G03 : Advanced Mathematics

(common to IT010 805G02 Advanced Mathematics)

Teaching Schedule: **Credits: 4**

2 hour Lecturer and 2 hour Tutorial per week

Objectives

- *To provide an understanding of Green's Function, Integral Equations, Gamma, Beta functions, Power Series solution of differential equation, Numerical solution of partial differential equations*

Module 1 (12 Hours)
Green's Function
Heavisides, unit step function – Derivative of unit step function – Dirac delta function – properties of delta function – Derivatives of delta function – testing functions – symbolic function – symbolic derivatives – inverse of differential operator – Green's function – initial value problems – boundary value problems – simple cases only

Module 2 (12 Hours)
Integral Equations
Definition of Volterra and Fredholm Integral equations – conversion of a linear differential equation into an integral equation – conversion of boundary value problem into an integral equation using Green's function – solution of Fredhlom integral equation with separable Kernels – Integral equations of convolution type – Neumann series solution.

Module 3 (12 Hours)
Gamma, Beta functions
Gamma function, Beta function – Relation between them – their transformations – use of them in the evaluation certain integrals – Dirichlet's integral – Liouville's extension of Dirichlet's theorem – Elliptic integral – Error function.

Module 4 (12 Hours)
Power Series solution of differential equation
The power series method – Legendre's Equation – Legendre's polynomial – Rodrigues formula – generating function – Bessel's equation – Bessel's function of the first kind – Orthogonality of Legendre's Polynomials and Bessel's functions.

Module 5 (12 Hours)
Numerical solution of partial differential equations
Classification of second order equations- Finite difference approximations to partial derivatives – solution of Laplace and Poisson's equations by finite difference method – solution of one dimensional heat equation by Crank – Nicolson method – solution one dimensional wave equation.

References

1. S.S Sasthri, “Introductory methods of Numerical Analysis”,Prentice Hall of India.
2. Ram P.Kanwal, Linear Integral Equation, Academic Press, New York.
3. Allen C.Pipkin, Springer, A Course on Integral Equations, Verlag.
4. H.K.Dass, Advanced Engg. Mathematics, S.Chand.
5. Michael D.Greenberge, Advanced Engg. Mathematics, Pearson Edn. Asia.
6. B.S.Grewal, Numrical methods in Engg.&science, Khanna Publishers.
7. R.F. Hoskins, Generalized functions, John Wiley and Sons.
8. Bernard Friedman, Principles and Techniques of Applied Mathematics, John Wiley and sons
9. James P.Keener, Principles of Applied Mathematics, Addison Wesley.
10. P.Kandasamy, K.Thilagavathy, K.Gunavathy Numerical methods, S.Chand & co

CS010 805G04: Software Architecture
(Common to IT010 805G01 Software Architecture)

Teaching scheme **Credits:** 4
2 hours lecture and 2 hour tutorial per week

Objectives

- *To understand the role of a software architecture in the development of an enterprise application system.*
- *To develop the ability to understand the models that are used to document a software architecture.*

Module I (13 hours)

Software Architecture—Software Architecture, Software Design Levels, The status of Software Engineering and Architecture.

Architecture Styles—Use of Patterns and Styles in Software Design, Common Architectural Styles -Pipes and Filters, Data Abstraction and Object Orientation, Event Based Implicit Invocation, Layered Systems, Repositories, Interpreters, **Process Control Paradigms**—Case Studies to Illustrate the use of Architectural Principles.

Module II (11 hours)

Architectural Design—Guidelines for User Interface Architectures, Design Space and Rules, Applying Design Space with an Example, A Validation Experiment.
The Quantified Design Space—Background, Quantified Design Space.

Module III (11 hours)

Formal models and Specifications— Formalizing the Architecture of a Specific System-Architectural Formalism and its Applications, Formalizing Various Architectural Styles, Filters, Pipes, Pipe-and-Filter System, Formalizing Architectural Design Space.

Module IV (14 hours)

Architectural Description Languages—Requirements for Architectural Description Languages, The Linguistic Character of Architectural Description, Desiderata for Architecture Description Languages, Problems.

First-Class Connectors—Current practice, Software System Composition . Adding Implicit Invocation to Traditional Programming Languages

Module V (11 hours)

Architectural Design Tools— UniCon A Universal Connecting Language, Components, Abstraction and Encapsulation, Types and Type checking.

Architectural Design - Exploiting Styles , Architectural Interconnection

References

1. Mary Shaw & David Garlan," *Software Architecture"*, Prentice Hall India Private Limited, Third Edition, New Delhi, 2000.
2. Len Bass, Paul Clements, & Rick Kazman, "*Software Architecture in Practice"*, Pearson Education.

CS010 805G05: Natural Language Processing

Teaching scheme **Credits**: 4

2 hours lecture and 2 hours tutorial per week

Objectives

- *To acquire a general introduction including the use of state automata for language processing*
- *To understand the fundamentals of syntax including a basic parse*
- *To explain advanced feature like feature structures and realistic parsing methodologies*
- *To explain basic concepts of remotes processing*
- *To give details about a typical natural language processing applications*

Module I (12 hours)

INTRODUCTION: Introduction: Knowledge in speech and language processing – Ambiguity – Models and Algorithms – Language, Thought and Understanding. Regular Expressions and automata: Regular expressions – Finite-State automata. Morphology and Finite-State Transducers: Survey of English morphology – Finite-State Morphological parsing – Combining FST lexicon and rules – Lexicon-Free FSTs: The porter stammer – Human morphological processing

Module II (12 hours)

SYNTAX: Word classes and part-of-speech tagging: English word classes – Tagsets for English – Part-of-speech tagging – Rule-based part-of-speech tagging – Stochastic part-of-speech tagging – Transformation-based tagging – Other issues. Context-Free Grammars for English: Constituency – Context-Free rules and trees – Sentence-level constructions – The noun phrase – Coordination – Agreement – The verb phase and sub categorization – Auxiliaries – Spoken language syntax – Grammars equivalence and normal form – Finite-State and Context-Free grammars – Grammars and human processing. Parsing with Context-Free Grammars: Parsing as search – A Basic Top-Down parser – Problems with the basic Top-Down parser – The early algorithm – Finite-State parsing methods.

Module III (12 hours)

ADVANCED FEATURES AND SYNTAX : Features and Unification: Feature structures – Unification of feature structures – Features structures in the grammar – Implementing unification – Parsing with unification constraints – Types and Inheritance. Lexicalized and Probabilistic Parsing: Probabilistic context-free grammar – problems with PCFGs – Probabilistic lexicalized CFGs – Dependency Grammars – Human parsing.

Module IV (12 hours)

SEMANTIC: Representing Meaning: Computational desiderata for representations – Meaning structure of language – First order predicate calculus – Some linguistically relevant concepts – Related representational approaches – Alternative approaches to meaning. Semantic Analysis: Syntax-Driven semantic analysis – Attachments for a fragment of English – Integrating semantic analysis into the early parser – Idioms and compositionality – Robust semantic analysis. Lexical semantics: relational among lexemes and their senses – WordNet: A database of lexical relations – The Internal structure of words – Creativity and the lexicon.

Module V (12 hours)

APPLICATIONS: Word Sense Disambiguation and Information Retrieval: Selectional restriction-based disambiguation – Robust word sense disambiguation – Information retrieval – other information retrieval tasks. Natural Language Generation: Introduction to language generation – Architecture for generation – Surface realization – Discourse planning – Other issues. Machine Translation: Language similarities and differences – The transfer metaphor – The interlingua idea: Using meaning – Direct translation – Using statistical techniques – Usability and system development.

References:

1. Daniel Jurafsky & James H.Martin, " Speech and Language Processing", Pearson Education(Singapore)Pte.Ltd.,2002.
2. James Allen, "Natural Language Understanding", Pearson Education, 2003

CS010 805G06 :Pattern Recognition

Teaching Schemes **Credits:4**
2 hours lecture and 2 hours tutorial per week

Objectives:

- *To impart a basic knowledge on pattern recognition and to give a sound idea on the topics of parameter estimation and supervised learning, linear discriminant functions and syntactic approach to PR.*
- *To provide a strong foundation to students to understand and design pattern recognition systems.*

Module I (12 hours)
Introduction: introduction to statistical, syntactic and descriptive approaches, features and feature extraction, learning and adaptation. Bayes Decision theory, introduction, continuous case, 2-categoryclassification, minimum error rate classification, classifiers. Discriminant functions and decision surfaces.

Module 2(12 hours)
Introuction- Maximum likelihood estimation - General principle,Gaussian case ; bias. Bayesian estimation – class conditioned density, parameterdistribution, Bayesian Parameter estimation – General Theory,Gibb's Algorithm – Comparison of Bayes Method with Maximum likelihood.

Module 3(12 hours)
Introduction,Density Estimation. Parzen Windows – Convergence of mean, variance,Kn – Nearest Neighbourestimation,Nearest neighbor rule,Converge error rate, error bound , partial distance.

Module 4(12 hours)
Linear discriminate functions and decision surfaces:-Introduction, training error, Threshold weight, discriminate function – two category case, multicategory case. Generalized discriminant function, Quadratic discriminant functions, Polynomial discriminant, PHI functions. Augmented vector.Two category linearly separable case: weight space, solution region, margin, learning rate ,algorithm(Gradient descent – newton)Relaxation procedures.

Module 5(12 hours)
Syntactic approach to PR : Introduction to pattern grammars and languages ,higher dimensional grammars, tree, graph, web, plex, and shape grammars, stochastic grammars , attribute grammars, Parsing techniques, grammatical inference.

References

1. R.O Duda, Hart P.E, “Pattern Classification And Scene Analysis”, John Wiley
2. Gonzalez R.C. & Thomson M.G., “Syntactic Pattern Recognition - An Introduction”, Addison Wesley.
3. J. T. Tou and R. C. Gonzalez, “Pattern Recognition Principles”, Wiley, 1974
4. Fu K.S., “Syntactic Pattern Recognition And Applications”, Prentice Hall,
5. Rajjan Shinghal, “Pattern Recognition: Techniques and Applications”, Oxford University Press, 2008.

CS010 806: Computer Graphics Lab

Teaching scheme **Credits: 2**
3 hours practical per week

Objectives

- *To acquaint the students with the implementation of fundamental algorithms in Computer Graphics.*

I. Experiments to implement the following: (**first 3 weeks**)

1. DDA Algorithm
2. Bresenham's Line drawing Algorithm for any slope.
3. Mid-point Circle Algorithm.
4. 2D Transformations

II. Experiments to implement the following:

1. 3D Rotations on a cube (about any axis, any general line) controlled by keyboard navigation keys.
2. 3D Rotations on a cube with hidden surface elimination.(keyboard controlled)
3. Composite transformations
4. Bezier cubic splines like screen saver
5. Any Fractal Construction (Koch curve)
6. Animations using the above experiments.(eg.moving along curved path)

Any experiment according to the syllabus of CS010 702 Computer Graphics can be substituted subjected to permission from competent authority.

CS010 807 Project Work

Teaching scheme **credits: 4**

6 hours practical per week

The progress in the project work is to be presented by the middle of eighth semester before the evaluation committee. By this time, the students will be in a position to publish a paper in international/ national journals/conferences. The EC can accept, accept with modification, and request a resubmission.

The progress of project work is found unsatisfactory by the EC during the middle of the eighth semester presentation, such students has to present again to the EC at the end of the semester and if it is also found unsatisfactory an extension of the project work can be given to the students.

Project report: To be prepared in proper format decided by the concerned department. The report shall record all aspects of the work, highlighting all the problems faced and the approach/method employed to solve such problems. Members of a project group shall prepare and submit **separate** reports. Report of each member shall give details of the work carried out by him/her, and only summarise other members' work.

The student's sessional marks for project will be out of 100, in which 60 marks will be based on day to day performance assessed by the guide. Balance 40 marks will be awarded based on the presentation of the project by the students before an evaluation committee.

For Project, the minimum for a pass shall be 50% of the total marks assigned to the Project work.

CS010 808 Viva -Voce

Teaching scheme **credits: 2**

A comprehensive oral Viva-voce examination will be conducted to assess the student's intellectual achievement, depth of understanding in the specified field of engineering and papers published / accepted for publication etc. At the time of viva-voce, certified bound reports of seminar and project work are to be presented for evaluation. The certified bound report(s) of educational tour/industrial training/ industrial visit shall also be brought during the final Viva-Voce.

An internal and external examiner is appointed by the University for the Conduct of viva voce University examination.

For Viva-voce, the minimum for a pass shall be 50% of the total marks assigned to the Viva-voce.

Note: If a candidate has passed all examinations of B.Tech. course (at the time of publication of results of eighth semester) except Viva-Voce in the eighth semester, a re-examination for the Viva-Voce should be conducted within one month after the publication of results. Each candidate should apply for this 'Save a Semester examination' within one week after the publication of eighth semester results.