DEPARTMENT OF COMPUTER SCIENCE
& ENGINEERING

COURSE STRUCTURE & SYLLABUS
(w.e.f. July2010)

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY,BURLA ,ORISSA

FIRST YEAR B.TECH
(COMMON TO ALL BRANCHES)

FIRST SEMESTER				SECOND SEMESTER			
Theory		**Contact Hrs.**	**CR**	**Theory**		**Contact Hrs.**	**CR**
Course Code	**Subject**	**L .T .P**		**Course Code**	**Subject**	**L. T. P**	
BMA 101	Mathematics-I	3 - 1 - 0	4	BMA 102	Mathematics-II	3 - 1 – 0	4
BPH 101/ BCH 101	Physics/Chemistry	3 - 1 - 0	4	BCH 101/ BPH 101	Chemistry/ Physics	3 - 1 – 0	4
BME 101/ BCS 101	Engg. Mechanicss/ Programming & Data Structure	3 - 1 - 0	4	BCS 101/ BME 101	Programming & Data Structure/ Engg. Mechanicss	3 - 1 – 0	4
BEE 101/ BEC 101	Basic Electrical Engg./ Basic Electronics	3 - 1 - 0	4	BEC 101/ BEE 101	Basic Electronics/ Basic Electrical Engg	3 - 1 – 0	4
BHU 101/ BCE 101	English for Communication/Env. Science & Engg.	3 - 1 - 0	4	BCE 101/ BHU 101	Env. Science & Engg./ English for Communication	3 - 1 – 0	4
Sessionals				**Sessionals**			
BPH 191/ BCH 191	Physics Lab./Chemistry Lab	0 - 0 - 3	2	BCH 191/ BPH 191	Chemistry Lab/ Physics Lab	0 - 0 – 3	2
BHU 191/ BCS 191	Language Lab./ Programming Lab.	0 - 0 - 3	2	BCS 191/ BHU 191	Programming Lab./ Language Lab.	0 - 0 – 3	2
BCE 191/ BME 191	Engineering Drawing/ Work Shop Practice	0 - 0 - 3	2	BME 191/ BCE 191	Work Shop Practice/ Engineering Drawing	0 - 0 – 3	2
BEE 191/ BEC 191	BEE Lab./ BE Lab.	0 - 0 - 3	2	BEC 191/ BEE 191	BE Lab./ BEE Lab.	0 - 0 – 3	2
EAA	Extra Academic Activities (NCC/NSS/Yoga)	0 - 0 - 3	0	EAA	Extra Academic Activities (NCC/NSS/Yoga)	0 - 0 – 3	0
	Total	**15-5-15**	**28**		**Total**	**15-3-15**	**28**

SECOND YEAR B.TECH
COMPUTER SCIENCE & ENGINEERING

THIRD SEMESTER				FOURTH SEMESTER			
Theory		**Contact Hrs.**	**CR**	**Theory**		**Contact Hrs.**	**CR**
Course Code	**Subject**	**L .T .P**		**Course Code**	**Subject**	**L. T. P**	
BMA	Mathematics-III	3 - 1 - 0	4	BMA	Mathematics-IV	3 - 1 - 0	4
BHU	Organizational Behavior	3 - 1 - 0	4	BHU	Engineering Economics & Costing	3 - 1 - 0	4
BCS	Object Oriented Programming	3 - 1 - 0	4	BCS	Computer Organization	3 - 1 - 0	4
BCS	Data and File structure	3 - 1 - 0	4	BCS	Data Base Engg	3 - 1 - 0	4
BEC	Analog Electronics Circuits	3 - 1 - 0	4	BEC	Digital Electronics Circuits	3 - 1 - 0	4
Sessionals				**Sessionals**			
BCS	Object Oriented Prog.Lab.	0 - 0 - 3	2	BCS	Advance Programming Lab.-II.	0 - 0 - 3	2
BCS	Advance Programming Lab.-I	0 - 0 - 3	2	BCS	DBE Lab.	0 - 0 - 3	2
BCS	Data & File Structure Lab.	0 - 0 - 3	2	BCS	Computer Organization Lab.	0 - 0 - 3	2
BEC	Analog Electronics Circuits Lab.	0 - 0 - 3	2	BEC	Digital Electronics Circuits Lab.	0 - 0 - 3	2
	Total	**15-5-12**	**28**		**Total**	**15-5-12**	**28**

THIRD YEAR B.TECH
COMPUTER SCIENCE & ENGINEERING

FIFTH SEMESTER				SIXTH SEMESTER			
Theory		**Contact Hrs.**	**CR**	**Theory**		**Contact Hrs.**	**CR**
Course Code	**Subject**	**L .T .P**		**Course Code**	**Subject**	**L. T. P**	
BCS	Microprocessors & Microcomputer	3 - 1 - 0	4	BCS	Compiler Design	3 - 1 - 0	4
BMA	Discrete Mathematical Str.	3 - 1 - 0	4	BCS	Software Engg. & OOAD	3 - 1 - 0	4
BCS	Operating System	3 - 1 - 0	4	BCS	Principles of Programming Languages	3 - 1 - 0	4
BCS	Theory of Computation	3 - 1 - 0	4	BCS	Internet & Web Technology-I	3 - 1 - 0	4
BCS	Data Communication & Computer Networks	3 - 1 - 0	4	BCS	Analysis & Design of Algorithms	3 - 1 - 0	4
Sessionals				**Sessionals**			
BCS	Operating System Lab.	0 - 0 - 3	2	BCS	Compiler Design Lab.	0 - 0 - 3	2
BCS	Data Communication and Computer Network Lab.	0 - 0 - 3	2	BCS	Internet & Web Tech Lab.	0 - 0 - 3	2
BCS	Microprocessors & Microcomputer Lab.	0 - 0 - 3	2	BCS	Software Engg. Lab.	0 - 0 - 3	2
BCS	Computational Lab.	0 - 0 - 3	2	BCS	Algorithm Design Lab.	0 - 0 - 3	2
	Total	**15-5-12**	**28**		**Total**	**15-5-12**	**28**

THIRD YEAR B.TECH
COMPUTER SCIENCE & ENGINEERING

SEVENTH SEMESTER				EIGHTH SEMESTER			
Theory		**Contact Hrs.**		**Theory**		**Contact Hrs.**	
Course Code	**Subject**	**L .T .P**	**CR**	**Course Code**	**Subject**	**L. T. P**	**CR**
BCS	Computer Graphics & Multimedia	3 - 1 - 0	4	BCS	Advanced Computer Architecture	3 - 1 - 0	4
BIT	E-Commerce & ERP	3 - 1 - 0	4	BIT	Mobile Computing	3 - 1 - 0	4
BCS	Data Mining	3 - 1 - 0	4		Elective-III	3 - 1 - 0	4
	Elective-I	3 - 1 - 0	4		Elective-IV	3 - 1 - 0	4
	Elective-II	3 - 1 - 0	4				
Sessionals					**Sessionals**		
BCS	Computer Graphics Lab.	0-0-3	2	BCS	Comprehensive Viva Voce	-	2
BCS	Simulation Lab.	0-0-3	2				
BCS	Seminar	0-0-3	2				
	Minor Project	0-0-3	2	BCS	Major Project	0 - 0 – 3	6
	Total	**15-5-12**	**28**		**Total**	12-4-3	24
Elective – I(Any one)				**Elective – III(Any one)**			
BCS	Artificial Intelligence			BEC	Microcontroller and Embedded Systems		
BCS	Soft Computing			BIT	Bio-Informatics		
				BEC	VLSI Design		
				BEC	Image Processing		
BCS	Distributed Computing			BEE	Cryptography & Network Security		
BEC	Digital Signal Processing			**Elective-IV(Any one)**			
				BCS	Advanced Operating System		
				BHU	Human Resource Management		
				BCS	Knowledge Management		
Elective-II(Any one)				BCS	Reinforcement Learning		
BCS	Modeling & Simulation			BCS	High Performance Computing		
BCS	Adv. Microprocessors			BHU	Intellectual Property Rights		
BCS	Adv Data Str & Algorithms						
	Nano Technology						

1st SEMESTER B.Tech. / 2nd SEMESTER B.Tech
(Common to all branches)

BCS 101 PROGRAMING & DATA STRUCTURE (3-1-0)Cr.-4

Module 1: (10 Lectures)

C Language Fundamentals, Arrays and Strings
Character set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedence of operators, Input – output Assignments, Control structures, Decision making and Branching, Decision making & looping. Declarations.

Module 2: (10 Lectures)

Monolithic vs Modular programs, User defined vs standard functions, formal vs Actual arguments, Functions category, function prototypes, parameter passing, Recursion, Storage Classes: Auto, Extern, Global, Static.Character handling in C. String handling functions.
Pointers, Structures, Union & File handling

Module 3: (10 Lectures)

Pointer variable and its importance, Pointer Arithmetic, passing parameters, Declaration of structures, pointer to pointer, pointer to structure, pointer to function, unions dynamic memory allocations, unions, file handling in C.

Module 4: (10 Lectures)

Development of Algorithms: Notations and Analysis, Storage structures for arrays-sparse matrices, Stacks and Queues:Applications of Stack:Prefix,Postfix and infix expressions. Circular queue, Double ended queue.

Text Books:

1. E. Balaguruswamy “Programming in C”, Tata McGraw Hill
2. Data Structures Using C & C++, Yedidyah Langsam Moshe J, Augenstein, Aaron M.Tenenbaum, Prentice, Hall of India, New Delhi.

Reference Books:

1. Y.Kanetkar, “Let us C”, BPB Publications.
2. Fundamentals of Data Structure, in c by Hariwitz and Sahni & Anderson Freed, University Press.
3. Data Structures by S.Lipschutz, Schaum’s outline series in Computes
4. Data Structure and Algorithms, G.A.S Pai , TMH

1st SEMESTER B.Tech. / 2nd SEMESTER B.Tech.
(Common to all branches)

BCS 191 PROGRAMMING LABORATORY(0-0-3)Cr.-2

Introduction to OS: Linux/Unix, DOS, Windows,
Vi editor, Shell Programming (on Unix),
File handling , directory structures, file permissions, creating and editing simple C programme, compilation and execution.

C Programming on variables and expression assignment, simple arithmetic
Loops, If-else, Case statements, break, continue, goto
Single and Multidimensional arrays

Functions, recursion, file handling in C

Pointers, address operator, declaring pointers and operators on pointers

Address of an array, structures, pointer to structure, dynamic memory allocation.

SECOND YEAR B.TECH
3RD SEMESTER

BCS-201 OBJECT ORIENTED PROGRAMMING (3-1-0) Cr.-4

Module – I

(10 Lectures)

Introduction to object oriented programming, user-defined types, polymorphism, and encapsulation. Getting started with C++ syntax, data-type, various, functions, exceptions and statement, namespaces and exceptions, operators, flow control, functions, recursion. Arrays and pointers, structures.

Module – II **(10 Lectures)**

Abstraction mechanisms: Classes, private, public construction, member functions, static members, references etc. class hierarchy, derived classes.

Inheritance: simple inheritance, polymorphism, object slicing, base initialization virtual functions.

Module – III **(12 Lectures)**

Prototypes, linkages, operator overloading, ambiguity, friends, member operators, operator function, I/O operator etc. Memory management: new delete, object copying copy constructors, assignment operator, this input/output. Exception handling: Exceptions and derived classes, function exception declarations, Unexpected exceptions, Exceptions when handling exceptions, resource capture and release etc.

Module – IV **(08 Lectures)**

Templates and standard Template library: template classes, declaration, template functions, namespaces, string, iterates hashes, iostreams and other type.

Design using C++ design and development, design and programming, role of classes.

Text Books:

1. Bhave & Patemar- Object oriented Progamming with C ++ , Pearson, Education.
2. Ashok N. Kamthane- Object oriented programming with ANSI & Turbo C ++., Pearso Education.
3. .Robort Lafore-Object-oriented programming in Microsoft C ++.
4. C.Balguru Swamy – C ++, TMH publication.
5. H.Schildt – C++, The Complete Reference, TMH.

BCS-202 **DATA AND FILE STRUCTUR (3-1-0)** **Credit-04**

I. Introduction to Data & file structures (5 Lectures)

II. Non- Linear data structures (8 Lectures)

- General Trees , Binary Trees,
- Conversion of general tree to binary
- BST
- Red-Black trees
- Multi linked structures
- Heaps
- Spanning Trees
- Application of trees

III. Sorting(9 Lectures)

- Growth of function , 'O' notation
- Complexity of algorithms, classification
- Internal sorting
- Insertion sorting
- Selection Sort

- Bubble Sort
- Quick sort
- Heap sort
- Radix sort
- External sort
- Multi way merge

IV. **Searching (5 Lectures)**
- Sequential Search
- Binary Search
- Search trees traversal
- Threaded Binary search trees
- AVL Tree – concept and construction

V. **Hashing (6 Lectures)**
- Hashing techniques
- Hash function
- Address calculation techniques- common hashing functions
- Collision resolution
- Linear probing, quadratic probing
- Double hashing
- Bucket addressing

VI. File Structures (7 Lectures)
- External storage devices
- Records - Concepts and organization
- Sequential file – structures and processing
- Indexed sequential files – strictures and processing
- Direct files
- Multi Key access

Text Books:

1. Data Structures Using C and C + + - Tanenbum (PHI) (chapter – 5,6,7)
2. Introduction to Data Structures with Applications by Tremblay and Sorensons (TMH)(chapter – 7.1-7.6,7.7,7.9,7.13)
3. Data Structures and algorithm Analysis in C – Weiss (Pearson Education)
4. Data Base Organisation – by Geo Widerhold – TMH
5. Data and File structure – by Loomis – PHI.

BCS 291 OOP LABORATORY (0-0-3) Credit – 02

1. Programs on concept of classes and objects.(1 class)
2. Programs using inheritance.(1 class)
   i. Single inheritance
   ii. Multiple inheritance
   iii. Multi level inheritance
   iv. Use of virtual base classes
3. Programs using static polymorphism.(1 class)
   i. Function overloading

ii. Ambiguities while dealing with function overloading

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

5. Programs on operator overloading.(1 class)
   i. Operator overloading using member operator functions.
   ii. Operator overloading using non member operator functions.
   iii. Advantages of using non member operator functions.
6. Programs on dynamic memory management using new, delete operators.(1 class)
7. Programs on copy constructor and usage of assignment operator.(1 class)
8. Programs on exception handling .(1 class)
9. Programs on generic programming using template function and template class.(1 class)
10. Programs on file handling.(1 class)

BCS 291 **APL-I LAB.(0-0-3)** **Credit – 02**

Basics on JAVA

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

BCS 296 **DATA & FILE STRUCTURE LAB (0-0-3)** **Credit-02**

1. Write a C/C++ Program to create a stack using an array and perform – i) Push operation, ii) Pop operation
2. Write a C Program to create a queue and perform – i) Push, ii) Pop, iii) Traversal
3. Write a C Program that uses Stack Operations to perform the following :-
   i) Converting an infix expression into postfix expression
   ii) Evaluating the postfix expression
4. Write a C Program that uses functions to perform the following operations on a single linked list : Creation, ii) Insertion, iii) Deletion, iv) Traversal
5. Write a C Program that uses functions to perform the following operations on a double linked list : Creation, ii) Insertion, iii) Deletion
6. Write a C Program that uses functions to perform the following operations on a Binary Tree : i) Creation, ii) Insertion, iii) Deletion
7. Write a C Program to construct an AVL-Tree and delete the selective nodes.
8. C Programs on : i) Bubble sort, ii) Selection sort, iii) Insertion sort, iv) Quick sort, v) Radix sort vi) Heap sort, vii) 2 Way Merge Sort

9. C Programs on : i) Sequential Search, ii) Binary Search

4TH SEMESTER

BCS-203 **COMPUTER ORGANIZATION –1 (3-1-0) Cr.-4**

Module-I

Introduction: (05 Period)

Basic Organization of Computers, Classification Micro, Mini, Mainframe and Super Computer. System Bus and Interconnection, PCI, Computer Function, I-Cycle, Interrupt and Class of Interrupts, Von-Neumann M/c: Structure of IAS.

Computer Arithmatic: (05 Period)

Data Representation:Fixed Point Representation,Floating Point Representation. Addition and Substraction,Multiplication Algorithm,Division Algorithm,Floating Point Arithmatic Operation,Decimal Arithmatic Operation,

CPU Organization: (05 Period)

Fundamental Concepts: Fetching and storing a word in Memory, Register Transfer, Performing an Arithmetic & Logic Operation, Execution of a Completes, Branching.

Module-II

General Register Organization: (13 Period)

Control word, Examples of Microsoft, Stack Organisation, Register Stack, Memory Stack, RPN, Ecaluation of Arithmetic Expression using RPN, Instruction Format: Three Address, Two Address, One Address and Zero Address Instruction, Addressing Modes: Types of Addressing modes, Numerical Examples, Program Relocation, Compaction, Data Transfer & Manipulation: Data transfer, Data Manipulation, Arithmetic, Logical & Bit Manipulation Instruction, Program Control: Conditional Branch Instruction, Subroutine, Program Interrupt, Types of Interrupt, RISC & CISC Characteristic. Control Unit Operation: Hardware Control & Micro Programmed Control,Introduction to Pipelining.

Module-III

Input/Output Organization: (9 Period)

Peripheral Devices, Input – output Interface, I/O Bus, Interface Module, Asynchronous Data Transfer, Strobe Control, Handshaking, Asynchronous Serial Transfer, Asynchronous Communication Interface, Modes of Transfer: Programmed I/O, Interrupt Driven I/O, Direct Memory Access (DMA), DMA Controller, I/O Channel & Processor.

Priority Interrupt: Daisy Chaining Priority, Parallel Priority Interrupt.

Module-IV

Memory Organization: (13 Period)

Computers Memory System Overview, Characteristics of Memory System, The Memory Hierarchy, Semi Conductor Main Memory types, Organisation, Memory cell Operation. Cache Memory: Cache Principles, Elements of Cache Design, Cache Size, Mapping function, Replacement Algorithm, LRU, FIFO, LFU, Write policy. Number of Caches: Single versus two level caches, Pentium Cache Organisation. Associative Memory: Hardware Organisation, Match Logic. Read Operation, Write Operation, Auxiliary Memory: Magnetic Disks, Magnetic Tape. Virtual Memory: Paging, Paging h/w, Address Mapping using pages, Segmentation h/w, Demand Paging, Memory Management h/w.

Text Books:

1. Computer Organization & Architecture – William Stallings, 7th Edition, PHI
2. Computer System Architecture : Morris Mano, 3rd Edition, PHI

Reference Books:

1. Computer Organization – by V.Carl Hamacher, Z.G.Vranesic, and S.G.Zaky, 5th Edition. McGraw Hill,
1. Computer Architecture and Organization, by - John P. Hayes, 3rd Edition, Mc Graw Hill International Editions.
2. Computer Organization & Design, (3rd Edition) by – D.A.Patterson & J.L.Hennessy – Morgan Kaufmann Publishers (Elseviers)
4. Computer Architecture and Parallel Processing – Hwang And Briggs_Mcgraw Hill 1985.

BCS-204 **DATABASE ENGINEERING (3-1-0)** **Cr.-04**

Module – I (10 Lectures)

Database System Architecture – Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages.
Data models- Entity Relationship (ER), Mapping ER Model to Relational Model, Network, Relational and Object Oriented Data models, Integrity Constraints and Data Manipulation Operations.

Module – II (08 Lectures)

Relation Query Language, Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE.
Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design, comparison of oracle & DB2.

Module – III (08 Lectures)

Query processing and Optimization: Evaluation of Relational Algebra Expression, Query Equivalence, Join strategies, Query optimization Algorithms.

Module – IV (12 Lectures)

Storage Strategies : Indices, B-Trees, Hashing.
Transaction Processing : Recovery and concurrency control, Locking and Time-stamp based schedules, Multi-version and Optimistic Concurrency control schemes.
Advanced topics : Object- Oriented and object Relational databases. Logical Database, Web databases, Distributed Databases, Data Warehouse and Data Mining.

Books:

1. Elmaski & Navathe- Fundamentals of Database systems, 4th Edition, Pearson Education
2. C.J. Date- An introduction to Database Systems, Pearson Education
3. Bipin Desai- An introduction to Database System, Galgotia publication.
4. G.W.Hansen and J.V.Hansen, Database Management and Design, 2nd Edition, PHI
5. Patrick O'Nell and Elizabeth O'Nell – Data Base – Principles Programming and Performance, Morgan Kaufmann

BCS 293 **DBE LAB (0-0-3)** **Credit –02**

1. Use of SQL Syntax for creation, insertion, updation, and deletion operation.
2. Use of SQL for Single table retrieval and group by clauses.
3. Use of SQL for sub-queries, set operations, and date manipulations.
4. Use of SQL for multiple table retrieval using join.
5. Use of Creation and Manipulation of SQL Views.
6. Programming approach using PL/SQL.
7. Use of PL/SQL Cursors(implicit, explicit, and parameterized).
8. Concurrency control using LOCK.
9. Data Redundancy using ROLLBACK, SAVEPOINT, and COMMIT
10. Use of Package (ORACLE).

BCS 294 COMPUTER ORGANIZATION LAB (0-0-3) Credit –02

1. Simulation of Fast Multiplication and Division Algorithm in MATLAB Using C Programs.
2. Some experiments using hardware training kits for floppy drive, dot matrix printer etc.
3. Dismantling and Assembling a PC along with study of connections, ports, chipsets, SMPS etc. Draw a block diagram of motherboard and other board.
4. A Study Project on some hardware technologies(memory, serial bus, parallel bus, microprocessor, i/o devices, motherboard etc.)

THIRD YEAR B.TECH
5TH SEMESTER

BCS-301 MICROPROCESSORS & MICROCOMPUTER (3-1-0) Cr.-4

Module – 1(8 Lectures)

Microprocessors, Microcomputers and Assembly Language: Microprocessors, Microprocessor Instruction Set, Computer Languages, Microcomputers.
Interfacing I/O devicesand Memory. Memory mapped I/O and I/O mapped I/o.

Module – II(8 Lectures)

The Processors: 8086/8088- Architectures, Pin Diagrams and Timing Diagrams:- Register Organisation of 8086, Architecture, Signal Descriptions of 8086, Physical Memory Organisation, General Bus Operation, I/O Addressing Capability, Special Processor Activities, Minimum Mode 8086 System and Timings, Maximum Mode 8086 System and Timings.

Module – III(8 Lectures)

8086 Instruction Set and ALP:- Machine Language Instruction Formats, Addressing Modes of 8086, Instruction Set of 8086, Assembler Directives and Operators, ALP

Module-IV(8 Lectures)

Special Architectural Features and Related Programming:- Introduction to Stack, Stack structure of 8086, Interrupts and Interrupt Service Routines, Interrupt Cycle of 8086, Non Maskable Interrupt, Maskable Interrupt (INTR), Interrupt Programming, Passing Parameters, to Size More than 64K, MACROS, Timings and Delays;

Module – V(8 Lectures)

General-Purpose Programmable Peripheral Devices:- The 8255A Programmable Peripheral Interface, Illustration: Interfacing Keyboard and Seven-Segment Display, Illustration: Bidirectional Data Transfer between Two Microcomputers, The 8259A Programmable Interrupt Controller, Direct Memory Access (DMA) and the 8257 DMA Controller

Text Books:

1.Advanced Microprocessor and Peripherals, by A.K. Roy & K.M. Bhurchandi – TMH Publication.

2. Microprocessors & Interfacing, by D.V.Hall, TMH Publication

Reference Books:

1. Microprocessor Architecture Programming and Application with 8085, by R.S.Gaonkar, Pernram International Publishing (India) (For Modules I, II, III & IV).

2. Microcomputers Systems: The 8086/8088 family – Architecture, Programming and Design, 2nd Edition by Liu and Gibson, PHI.

BMA – 301 DISCRETE MATHEMATICAL STRUCTURES (3-1-0) Cr.-04

Module-I (12 Lectures)

Logic, Prepositional Equivalence, Predicates and Quantifiers, Methods of Proofs, Proof strategy, Sequences and Summations, Mathematical Induction, Recursive Definitions and Structural Induction, Program Correctness.

Module-II (6 Lectures)

The Basics of counting, the Pigeonhole Principles, Permutations and Combinations, Generalized Permutations and Combinations, Recurrence Relations, Solving Recurrence Relations, Generating functions, Inclusion- Exclusion, Applications of Inclusion-Exclusion.

Relations and their Properties, n-ary relations and their Applications, Representing relations, Closures of Relations, Equivalence of Relations, Partial Orderings,

Module-III (10 Lectures)

Introduction to Graphs , Graph Terminology, Representing Graphs and Graph Isomorphism, Connectivity, Eulor and Hamilton paths, Planner Graphs, Graph coloring, Introduction to trees, Applications of Trees.

Module-IV (12 Lectures)

Groups, Subgroups, Generators and Evaluation of powers, cosets and Lagrange's theorm, Permutation Groups and Burnside's theorm, Isomorphism and Automorphisms and Homomorphisms and Normal Subgroups, Rings, Integral Domains and fields.

Lattices and Algebras Systems, Principles of Duality, Basic properties of Algebraic Systems defined by Lattices, Distributive and complimented Lattices, Boolean Lattices and Boolean Algebras, Uniqueness of finite Boolean Expressions, Prepositional calculus.

Coding of Binary Information and Error Detection, Decoding and Error Correction.

Text Books

1. K.H. Rosen : Discrete Mathematics and its application 5th Edition Tata Mc GrawHill,

Chapter : 1 (1.1-1.5) 3(3.1 – 3.4, 3.6), 4 (4.1 4.3, 4.5) 6 (6.1, 6.2, 6.4- 6.6), 7 (7.1 – 7.6 _), 8 (8.1-8.5, 8.7, 8.8) 9(9.1, 9.2) .

2. C.L. Liu – Elements of Discrete Mathematics 2nd Edition TMH 2000.Chapters : 11 (11.1- 11.10)(except 11.7) , 12 (12.1 – 12.8)

3. Bernand Kalman : : Discrete Mathematical structures , 3rd edition Chapters : 11 (11.1-11.2)

BCS-302 OPERATING SYSTEMS (3-1-0) Cr.-4

Module – I (10 Lectures)

Introduction: What is an Operating Systems?
Simple Batch Systems, Multiprogramming and Time-Sharing systems. Personal Computer Systems, Parallel Systems, Distributed systems and Real time Systems.
Operating Systems structures: systems components, protection system, O.S. Services, system calls.
Process Management: Process concept, process scheduling, Operation on process, Cooperating Processes, Inter process communication. Threads CPU Scheduling: Basic concepts, scheduling algorithms.
Process Synchronization :Critical Section Problem,Synchronization Mechanism:software and hardware,semaphores,monitors

Module – II (10 Lectures)
Deadlocks: System model, Deadlock Characterization Methods for Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, recovery from Deadlock.
Memory management: Background, Logical versus Physical Address space, swapping, contiguous Allocation. Paging, Segmentation.
Virtual memory: Background, Demand paging, performance of Demand paging, Page Replacement, page Replacement Algorithms. Allocation of frames, Thrashing, Demand Segmentation.

Module – III (10 Lectures)

File – system Interface : file concept, Access Methods Directory implementation, Recovery.

Module – IV(10 Lectures)

I/O systems: Overview, I/O Hardware, Application of I/O interface, Kernel I/O – subsystem Transforming I/O requests to Hardware operations.
Secondary storage Structure: Disk Structure. Disk scheduling, Disk management, Swap space management, Disk Reliability,
Protection and Security:Breaches,solutions,mechanisms,inside attack,outside attack.
Case Studies: LINUX, WINDOW NT.

Text Book:

Operating System Concepts: Abraham Silberschatz and Peter Bear Galvin, Addison Wesley -7th Edition 2008
Chapter – 1, Chapter –3 (3.1,3.2,3.3), Chapter – 4, chapter – 5 (5.1, 5.2, 5.3) , Chapter – 7 (7.1,-7.7), Chapter-8, chapter – 8, Chapter – 9, Chapter-10, Chapter- 11, Chapter-12, (12.1-12.5), Chapter-13(13.1-1.35)

Reference Book :
1. Operating System, McGraw Hill, Madnik & Donovan.
2. Operating Systems and system progamming, SCITECH, P. Blkeiahn Prasad.
3. Moswen O.S. – PHI, Andrew, S. Tannenbaum

BCS 303 THEORY OF COMPUTATION (3-1-0) Cr.-4

Module – I (10 Lectures)

Introduction to Automata: The Methods Introduction to Finite Automata, Structural Representations, Automata and Complexity.
Proving Equivalences about Sets, The Contrapositive, Proof by Contradiction,
Inductive Proofs: General Concepts of Automata Theory: Alphabets Strings, Languages, Applications of Automata Theory.

Finite Automata: The Ground Rules, The Protocol, Deterministic Finite Automata: Definition of a Deterministic Finite Automata, How a DFA Processes Strings, Simpler Notations for DFA's, Extending the Transition Function to Strings, The Language of a DFA
Nondeterministic Finite Automata: An Informal View. The Extended Transition Function, The Languages of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata.
Finite Automata With Epsilon-Transitions: Uses of $\in$-Transitions, The Formal Notation for an $\in$-NFA, Epsilon-Closures, Extended Transitions and Languages for $\in$-NFA's, Eliminating $\in$-Transitions.

Module – II (10 Lectures)

Regular Expressions and Languages: Regular Expressions: The Operators of regular Expressions, Building Regular Expressions, Precedence of Regular-Expression Operators, Precedence of Regular-Expression Operators
Finite Automata and Regular Expressions: From DFA's to Regular Expressions, Converting DFA's to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata.
Algebraic Laws for Regular Expressions:
Properties of Regular Languages: The Pumping Lemma for Regular Languages, Applications of the Pumping Lemma Closure Properties of Regular Languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata,

Context-Free Grammars and Languages: Definition of Context-Free Grammars, Derivations Using a Grammars Leftmost and Rightmost Derivations, The Languages of a Grammar,
Parse Trees: Constructing Parse Trees, The Yield of a Parse Tree, Inference Derivations, and Parse Trees, From Inferences to Trees, From Trees to Derivations, From Derivation to Recursive Inferences,
Applications of Context-Free Grammars: Parsers, Ambiguity in Grammars and Languages: Ambiguous Grammars, Removing Ambiguity From Grammars, Leftmost Derivations as a Way to Express Ambiguity, Inherent Anbiguity

Module – III **(10 Lectures)**

Pushdown Automata: Definition Formal Definition of Pushdown Automata, A Graphical Notation for PDA's, Instantaneous Descriptions of a PDA,
Languages of PDA: Acceptance by Final State, Acceptance by Empty Stack, From Empty Stack to Final State, From Final State to Empty Stack
Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata, From PDA's to Grammars

Deterministic Pushdown Automata: Definition of a Deterministic PDA, Regular Languages and Deterministic PDA's, DPDA's and Context-Free Languages, DPDA's and Ambiguous Grammars

Properties of Context-Free Languages: Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages, Decision Properties of CFL's

Module –IV **(10 Lectures)**

Introduction to Turing Machines: The Turing Machine: The Instantaneous Descriptions for Turing Machines, Transition Diagrams for Turing Machines, The Language of a Turing Machine, Turing Machines and Halting
Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Restricted Turing Machines, Turing Machines and Computers,

Undecidability: A Language That is Not Recursively Enumerable, Enumerating the Binary Strings, Codes for Turing Machines, The Diagonalization Language
An Undecidable Problem That Is RE: Recursive Languages, Complements of Recursive and RE languages, The Universal Languages, Undecidability of the Universal Language

Undecidable Problems About Turing Machines: Reductions, Turing Machines That Accept the Empty Language
Post's Correspondence Problem: Definition of Post's Correspondence Problem, The "Modified" PCP
Other Undecidable Problems: Undecidability of Ambiguity for CFG's

Text Book:

1. Introduction to Automata Theory Languages, and Computation, by J.E.Hopcroft, R.Motwani & J.D.Ullman (3rd Edition) – Pearson Education
2. Theory of Computer Science (Automata Language & Computations), by K.L.Mishra & N. Chandrashekhar, PHI

DATA COMMUNICATION & COMPUTER NETWORKS (3-1-0) Cr.-4

BCS 304

Module – I(12 Lectures)

Overview of Data Communications and Networking.
Physical Layer : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.
Digital Transmission: Line coding, Block coding, Sampling, Transmission mode.
Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals. Multiplexing : FDM , WDM , TDM ,
Transmission Media: Guided Media, Unguided media (wireless)
Circuit switching and Telephone Network: Circuit switching, Telephone network.

Module –II(12 Lectures)

Data Link Layer
Error Detection and correction: Types of Errors, Detection, Error Correction
Data Link Control and Protocols:
Flow and Error Control, Stop-and-wait ARQ. Go-Back-N ARQ, Selective Repeat ARQ, HDLC.
Point-to –Point Access: PPP
Point –to- Point Protocol, PPP Stack,
Multiple Access
Random Access, Controlled Access, Channelization.
Local area Network: Ethernet.
Traditional Ethernet, Fast Ethernet, Gigabit Ethernet. Token bus, token ring
Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.

Module – III(8 Lectures)

Network Layer:
Host to Host Delivery: Internetworking, addressing and Routing

Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6
Transport Layer: Process to Process Delivery: UDP; TCP congestion control and Quality of service.

Module-IV(8 Lectures)

Application Layer :
Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.

Text Books:
1. Data Communications and Networking: Behrouz A. Forouzan, Tata McGraw-Hill, 4th Ed
3. Computer Networks: A. S. Tannenbum, D. Wetherall, Prentice Hall, Imprint of Pearson 5th Ed
Reference Book : .
1. Computer Networks:A system Approach:Larry L, Peterson and Bruce S. Davie,Elsevier, 4th Ed
2. Computer Networks: Natalia Olifer, Victor Olifer, Willey India
3. Data and Computer Communications: William Stallings, Prentice Hall, Imprint of Pearson, 9th Ed.
4. Data communication & Computer Networks: Gupta, Prentice Hall of India
5. Network for Computer Scientists & Engineers: Zheng, Oxford University Press
6. Data Communications and Networking: White, Cengage Learning

BCS 391 **OPERATING SYSTEMS LAB (0-0-3)** **Credit –02**

1. Study of Unix/Linux Commands.(2 classes)
2. Write a program to allocate blocks of memory.
3. Write a program to implement best fit algorithm in paging memory.
4. Write a program to implement the bit vector for free space management.
5. Write a program to implement first fit algorithm in paging memory.
6. Write a program to implement worst fit algorithm in paging memory.
7. Write a program to create a unique file name by the user or by the system.
8. Write a program to implement DEKKERS ALGORITHM for mutual exclusion problem.
9. Write a program to implement DINING PHILOSOPHER problem.
10. Write a program for FCFS cpu scheduling algorithm.
11. Write a program for FIFO page replacement algorithm.
12. Write a program for LRU page replacement algorithm.
13. Write a program for Optimal page replacement algorithm.

14. Write a program to implement paging scheme.

15. Write a program for ROUND ROBIN cpu scheduling algorithm.

16. Write a program for SJF cpu scheduling algorithm.

17. Write a program to implement producer-consumer problem of IPC.

18. Write a program for to create two processes and wait for them to complete.

19. Write a program to make packaging and sending as in IPC.

20. Write a program to illustrate the function of a dispatcher.

BCS 393 **MICROPROCESSOR LAB (0-0-3)** **Credit-02**

8085

1. Addition, subtraction, multiplication and division of two 8 bit numbers
2. Smallest/largest number among n numbers in a given data array, Binary to Gray code, Hexadecimal to decimal conversion

Interfacing

1. Generate square wave on all lines of 8255 with different frequencies
2. Study of stepper motor and its operations

Optional (any two)

1. Study of traffic light controller
2. Study of elevator simulator
3. Generation of square, triangular and saw tooth wave using D to A Converter
4. Study of 8253 and its operation(Mode0, Mode2, Mode3)
5. Study of Mode0,Mode1 and BSR Mode operation of 8255
6. Study of 8279 (keyboard and display interface)
7. Study of 8259 Programmable Interrupt Controller

8051 Microcontroller

1. Initialize data to registers and memory using immediate, register, direct and indirect Addressing mode.

Optional (any one)

1. Addition and subtraction of 16 bit numbers
2. Multiplication and division of two 16 bit numbers
3. Transfer a block of data to another memory location using indexing
4. Operation of 8255 using 8051 microcontroller

8086

1.Addition , subtraction ,multiplication and division of 16 bit numbers, 2's complement of a 16 bit number

Optional (any one)

1. Finding a particular data element in a given data array
2. Marking a specific bit of a number using look-up table
3. Largest/smallest number of a given data array
4. To separate the odd and even numbers from a given data array
5. Sorting an array of numbers in ascending/descending order

BCS 392 **DCCN LAB(0-0-3)** **Credit-02**

Some Network protocol simulation using NetSim, NS2, etc. for

1. Analysing number of transmitting nodes vs. collision count, mean delay for Ethernet LAN .
2. Analysing bus vs. star-switch with respect to number of collisions (for a fixed number of transmitting nodes) for Ethernet LAN
3. Analysing performance of token ring with number of nodes vs. response time, mean delay using NetSim.
4. Comparing the throughput and normalized throughput for token ring and token bus for different transmitting nodes.
5. Comparing the CSMA/CD vs. CSMA/CA protocols (for a fixed number of transmitting nodes).
6. Analysing the difference between unicast and broadcast transmission (for a fixed number of transmitting nodes).
7. Verification of stop-and-wait protocol.
8. Verification of Go-back-N protocol.
9. Verification of Selective repeat protocol.
10. Verification of distance vector routing algorithm.
11. Verification of link state routing algorithm.

BCS 394 **COMPUTATIONAL LAB(0-0-3)** **Credit-02**

1. Construction of NFA.
2. Construction of DFA.
3. Checking ambiguity of a context free grammar.
4. Construction of PDA.
5. Construction of TM

6TH SEMESTER

BCS-305 **COMPILER DESIGN (3-1-0)** **Credit-04**

Module-I **(10 Lectures)**

Introduction to Compiling:

Compilers, Analysis of the source programe, The phases of a compiler, Cousins of the compiler, The grouping of phases, Compiler-construction tools

A Simple One-Pass Compiler:

Overview, Syntax definition, Syntax-directed translation, Parsing, A translator for simple expressions, Lexical analysis, Incorporating a symbol table, Abstract stack machines, Putting the techniques together

Lexical Analysis:

The role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, A language for specifying lexical analyzers, Finite automata, From a regular

expression to an NFA, Design of a lexical analyzer generator, Optimization of DFA-based pattern matchers

Module-II **(15 Lectures)**

Syntax Analysis:

The role of the parser, Context-free grammars, Writing a grammar, Top-down parsing, Bottom-up parsing, Operator-precedence parsing, LR parsers, Using ambiguous grammars, Parser generators

Syntax-Directed Translation:

Syntax-directed definitions, Construction of syntax trees, Bottom-up evaluation of S-attributed definitions, L-attributed definitions, Top-down translation, Bottom-up evaluation of inherited attributes, Recursive evaluators, Space for attribute values at compile time, Assigning space at compile time, Analysis of syntax-directed definitions

Module-III **(6 Lectures)**

Type Checking:

Type systems, Specification of a simple type checker, Equivalence of type expressions, Type conversions, Overloading of functions and operators, Polymorphic functions, An algorithm for unification

Run-Time Environments:

Source language issues, Storage organization, Storage-allocation strategies, Access to nonlocal names, parameter passing, Symbol tables, Language facilities for dynamic storage allocation, Dynamic storage allocation techniques, Storage allocation in Fortran

Module-IV **(9 Lectures)**

Intermediate Code Generation:

Intermediate languages, Declarations**,** Assignment statements, Boolean expressions, Case statements, Back Patching, Procedure calls

Code generation:

Issues in the design of a code generator, The target machine, Run-time storage management, Basic blocks and flow graphs, Next-use information, A Simple code generator, Register allocation and assignment, The dag representation of basic blocks, Peephole optimization, Generating code from dags, Dynamic programming code-generation algorithm, Code-generator generators

Code Optimization:

Introduction, The Principal sources of optimization, Optimization of basic blocks, Loops in flow graphs, Introduction to global data-flow analysis, Iterative solution of data-flow equations, Code-improving transformations, Dealing with aliases, Data-flow analysis of structured flow graphs, Efficient data-flow algorithms, A tool for data-flow analysis, Estimation of types, Symbolic debugging of optimized code.

Text Books:

1. Compilers Principles, Techniques, & Tools, by A.V.Aho, R.Sethi & J.D.Ullman, Pearson Education

2. Principle of Compiler Design, A.V.Aho and J.D. Ullman, Addition – Wesley

BCS-306 **SOFTWARE ENGINEERING & OOAD (3-1-0) Cr.-4**

Module I **(10 Lectures)**

Introductory concepts: Introduction, definition, objectives, Life cycle – Requirements analysis and specification.

Design and Analysis: Cohesion and coupling, Data flow oriented Design: Transform centered design, Transaction centered design. Analysis of specific systems like Inventory control, Reservation system.

Module II **(10 Lectures)**

Object-oriented Design: Object modeling using UML, use case diagram, class diagram, interaction diagrams: activity diagram, unified development process.

Module III **(12 Lectures)**

Implementing and Testing: Programming language characteristics, fundamentals, languages, classes, coding style efficiency. Testing: Objectives, black box and white box testing, various testing strategies, Art of debugging. Maintenance, Reliability and Availability: Maintenance: Characteristics, controlling factors, maintenance tasks, side effects, preventive maintenance – Re Engineering – Reverse Engineering – configuration management – Maintenance tools and techniques. Reliability : Concepts, Errors, Faults, Repair and availability, reliability and availability models, Recent trends and developments.

Module IV **(8 Lectures)**

Software quality: SEI CMM and ISO-9001. Software reliability and fault-tolerance, software project planning, monitoring, and control. Computer-aided software engineering (CASE), Component model of software development, Software reuse.

Text Book:

1. Mall Rajib, Fundamentals of Software Engineering, PHI.
2. Pressman, Software Engineering Practitioner’s Approach, TMH.

BCS-307 PRINCIPLES OF PROGRAMMING LANGUAGES (3-1-0)Cr.-4

Module-I (10 Lectures)

Inductive Sets of Data: Recursively specified Data, Recursively Specified programs, Scoping and Binding of variables.

Data Abstraction: Specifying Data via Interfaces, An abstract for Inductive Data Types, Representation strategies for data types. A queue abstraction.

Module-II(10 Lectures)

Environment – passing Interpreters: A simple interpreter, The front end, Conditional Evaluation, Local binding, procedures, Recursion, Variable assignment, Parameter passing variations, statements.

Types: Typed languages, Type checking, Enforcing Abstraction Boundaries, Type Inference.

Module-III (10 Lectures)

Objects and Classes: Object – Oriented programming, Inheritance, The language, Implementations,

Objects and Types: A Simple Typed Object – Oriented languages, The type checker, The translator.

Module-IV (10 Lectures)

Continuation – Passing Interpreters: Continuation – Passing Interpreter, Procedural Representation of continuations, An Imperative Interpreter, Exceptions and control flow, Multithreading, Logic programming.

Continuation Passing Style: Tail form, Converting to continuation – Passing style, Examples, of the CPS transformation, Implementing the CPS transformation, Modeling computational effects.

Text Book:

1. Essentials of programming languages – by Daniel P.Friedman, M.Wand and C.T.Hoynes, 2nd Edition, PHI.

BCS-309 **ANALYSIS & DESIGN OF ALGORITHMS (3-1-0)Cr.-4**

Module – I **(10 Lectures)**

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

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

Module – II **(10 Lectures)**

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

Greedy Algorithms- (Activity selection problem, Elements of Greedy strategy, fractional knapsack problem, Huffman codes).

Module – III **(10 Lectures)**

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

Graph Algorithm: Breadth first and depth first search, Minimum spanning Trees, Kruskat and prim' s algorithms, single – source shortest paths (Bellman-ford and dijkstra's algorithms).

Module- IV **(10 Lectures)**

Fast Fourier Transform, string matching (Rabin – Karp algorithm), NP- Completeness (Polynomial time verification, NP- Completeness and reducibility , NP complete problems (without proofs), Approximation algorithms (Traveling Salesman Problem).

Text Book:
T.H. Coremen, C.E. Leiserson, R.L. Rivest,
C. Stein: Introduction to algorithms – 2nd edition, PHI , 2002.

Chapters : 1,2,3,4 (excluding 4.4), 6,7 (7.4.1), 8 (8.1)15 (15.2,15.3,15.4), 16 (16.1,16.2,16.3), 21 (21.1, 21.2, 21.3), 22(22.222.3), 23,24 (24.1,24.2,24.3), 30,31 (31.131.2)34,35 (35.2).

BCS-308 **INTERNET & WEB TECHNOLOGY - I (3-1-0)Cr.-4**

Module I **(10 Lectures)**

Internet architecture: Internet overview, evolution of internet. Internet components – Local Area Networks, Access Networks, Core Networks, Routers, Transmission infrastructure, ISPs. Packet switching fundamentals-Packet Switching versus Circuit Switching, Connectionless packet switching (IP). Internet Standards: Standards bodies and the standards process, IETF, ITU, IEEE, ATM Forum.

Module II **(10 Lectures)**

Networking protocols: Network Protocol Overview: What are networking protocols, and what do they do? Key protocol architectures. IP Network Overview: What are the key IP network capabilities? How will these capabilities adapt to future network? IP protocol operation. IP addressing: IP address classes. Why are IP addresses under pressure, and what fixes are in place? TCP Fundamentals: How does TCP shield end users from IP network problems? TCP protocol operation and capabilities. TCP/IP: routing.

Module III **(10 Lectures)**

Access Methods and Internet working: Access Network Architectures: Access network characteristics. Differences between Access Networks, Local Area Networks and Wide Area Networks. Access Technologies: Why there is an upper limit on modem speeds. Voice grade modems, ADSL, Cable Modems, Frame Relay. DNS: Domain Names. Resolving Domain Names to IP addresses (DNS operation). Registering Domain Names and solving Domain name disputes. Routing: How the key IP routing protocols (OSPF and BGP4) operate. Implications of future Internet growth on routing protocol performance.

Module IV **(10 Lectures)**

Internet applications: FTP, Telnet, Email, Chat. World Wide Web: HTTP protocol. Search Engines. E-Commerce and security issues including symmetric and asymmetric key, encryption and digital signature, and authentication. Emerging trends, Internet telephony, virtual reality over the web, etc. Intranet and extranet, firewall.

Books:

1. Data & Computer Communications, By William Stallings
2. Computer Networks, A system approach By Larry L.Peterson, Bruce S. Davie
3. Internetworking with TCP / IP, Principles, Protocols & Architecture, By Douglas E.Comer.
4. TCP / IP – clearly Explained – by Pete Loshin, Morgan Kaufmann Publishers.
5. TCP / IP Network Administration by Craig Hunt, Shroff Publishers & Distributors Pvt.Ltd.
6. The Internet and its protocols – A Comparative Approach, by A.Farrel I Elseviers, (Morgan Kaufmann Publishers).

BCS 395 **COMPILER DESIGN LAB (0-0-3)** **Credit –02**

1. Write a program in C to design a weighted directed graph.
2. Write a program in C for accepting and validating floating point and fixed point numbers.
3. Write a program in C for tokenizing the C program. The program will output a file with list of all the tokens and the types of tokens for classification.
4. Write a program to pick up comment lines in a C/C++/JAVA Program.
5. Convert a simple file automation (e.g: All strings ending with abb) into a program.
6. Design of a recursive descent parser.
7. Implementation of FIRST & FOLLOW functions.
8. Simulation of LL(1) parsing techniques.
9. Develop a rudimentary C Processor capable of handling the " define, ifdef, ifndef, include " directives.
10. Case studies on some basic compilers.

BCS 496 **INTERNET WEB TECHNOLOGY LAB(0-0-3)** **Credit-02**

1. Introduction to major internet protocol- SFTP
2. HTML- Basics of HTML., text, image, other MIME types, lists, tables, HTTP methods, forms.
3. Multimedia on the Web- Embedding audio and video files in HTML
4. Java Script- Introduction to Java Script for client side validation.
5. Serves side scripting – Introduction to fundamentals concepts of ASP or JSP or PHP (any one platform depending on instructor). Basics of CGI scripting using Perl or C. Simple examples of request/ response objects. Basic introduction to web solutions architecture.

BCS 397 **SOFTWARE ENGINEERING LAB.(0-0-3)** **Credit – 02**

1. Time management software of a company
2. Hotel automation software
3. Judiciary information system software
4. Restaurant automation software

5. Supermarket automation software
6. Newspaper agency automation software
7. Medicine shop software
8. Bookshop automation software
9. Road tax information management system
10. Railway reservation system
11. Electricity billing system
12. Inventory control system
13. Library management system
14. Payroll management system
15. Banking system

BCS 398 **ADA LAB (0-0-3)** **Credit – 02**

Elementary Problems

1. Implement polynomial addition using a single linked list.
2. Implement insertion routine in an AVL tree using rotation .
3. Implement heap sort using a max heap.
4. Implement DFS/BFS routine in a connected graph.

Divide and Conquer Algorithm

1. write a quick sort routine,run it for a different input sizes and calculate the time of running . Plot a graph input size vs time.
2. Implement two way merge sort and calculate the time of sorting .

Greedy Algorithm

1. Given a set of weights,form a Huffman tree from the weight and also find out the code corresponding to each weight .
2. Take a weighted graph as an input ,find out one MST using Kruskal/Prim's algorithm .

Dynamic Programming

1. Find out a solution for 0/1 Knapsack problem .
2. Given two sequences of character, find out their longest common subsequence using dynamic programming.

NP complete and NP hard problems

1. Find out a solution to graph colorability problem of an input graph.
2. Find out a solution to sum of subset problems

7TH SEMESTER

BCS-401 **COMPUTER GRAPHICS & MULTIMIDIA (3-1-0)** **Cr.-04**

Module I **(10 Lectures)**

A Survey of Computer Graphics:
Computer Aided Design, Presentation Graphics, Computer art, Entertainment, education and Training, Visualization, Image Processing, graphical User Interface.

Overview of Graphics System: Video Display Devices, Raster-Scan and Random Scan Systems, Input Devices Hard Copy Devices, Graphics Software.

Graphic User Interface and Interactive Input Methods: The User Dialogue, Input of graphical Data, Input Function, Initial Values for input Device parameters, Interactive Picture construction.

Output Primitives: Points and lines Bresenham's Line Algorithm, Midpoint Circle Algorithm, Filled Area Primitives.

Attributes of Output Primitives: Line Curve, Color, Are fill and Character Attributes, Bundled Attributes, Antialiasing.

Module II **(10 Lectures)**

Two Dimensional Geometric Transformation: Basic Transformation (Translation, rotation, Scaling) Matrix Representation and Homogeneous coordination, Composite Transformations, Reflection Shears, Transformation between coordinate system.

Two Dimensional Viewing: the viewing Pipeline Viewing coordinate Reference frame, window-to view port coordinate Transformation.

Line Clipping (Cohen-Sutherland Algorithm) and Polygon Clipping (Sutherland-Hodgeman Algorithm)

Module III **(10 Lectures)**

Three Dimensional Object Representation: Polygon Surface, quadratic Surface, Spline Representative, Bezier Curves and Surface B-Spline Curves and surfaces.

Fractal Geometry Methods: Fractal Generation Procedure, Classification of Fractals Dimension, geometric Construction of Deterministic self-similar.

Three Dimensional Geometric and Modeling Transformations: Translation Rotation, Scaling, Reflections, shear, Composite Transformation, Modeling and Coordinate Transformation.

Three Dimensional Viewing: Viewing Pipeline, Viewing Coordinates, Projections (Parallel and Prospective) Clipping Implementation of above using open GL

Module IV **(10 Lectures)**

Visible Surface Detection Method: Backface Detection, Depth Buffer, A Buffer, Scan line and Depth sorting

Illumination Models: Basic Models, Displaying Light Intensities, Halftone Pattern and Dithering Techniques

Surface Rending Methods: Polygon Rendering Methods, Gouraud and Phong Shading

Quick Introduction to Computer Animation
Implementation of above using Open GL

Text Books:

1. Computer Graphics, D.Hearn and M.P.Baker (C Version), Prentice Hall, 1999
2. Open GL Super Bible, R.S.Wright and M.Sweet, Tech Media.

Reference Books:

1. Computer Graphics Principle and Practice, J.D.Foley, A.Dam, S.K.Feiner, Addison, Wesley.
2. Edward Angel- Interactive Computer Graphics-A Top Down Approach with Open GL.

BCS-402 **E-COMMERCE & ERP (3-1-0)** **Cr.-04**

Module – I **(10 Lectures)**

Electronic Commerce: Overview, Definitions, Advantages & Disadvantages of E-Commerce, Threats of E-Commerce, Managerial Prospective, Rules & Regulations for Controlling E-Commerce, Cyber Laws.

Technologies: Relationship between E-Commerce and Networking, Different Types of Networking for E-Commerce, internet, intranet, EDI Systems.

Wireless Application Protocol: Definition, Hand Held Devices, Mobility & Commerce. Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement for E-Commerce.
Business Models of E-Commerce; Model Based on Transaction Type, Model Based on Transaction Party – B2B, B2C, C2B, C2C, E-Governance.

Module – II **(10 Lectures)**

E-strategy: Overview, Strategic Methods for developing E-Commerce.
Four Cs (Convergence, Collaborative Computing, Content Management & Call Centre).

Convergence: Technological Advances in Convergence – Types, Convergence and its implications, Convergence and Electronic Commerce.
Collaborative Computing: Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security.
Content Management: Definition of content, Authoring Tools and Content Management, Content – partnership, repositories, convergence, providers Web Traffic & Traffic management: Content Marketing.
Call Centre: Definition, Need, Tasks Handled, Mode of Operation, Equipment, Strength & Weaknesses of Call Centre, Customer Premises Equipment (CPE). [6L]
Supply Chain Management: E-logistics, Supply Chain Portal, Supply Chain planning Tools (SCP Tools), Supply Chain Execution (SCE), SCE – Framework, Internet's effect on Supply Chain Power.

Module – III **(10 Lectures)**

E-Payment Mechanism; Payment through card system, E-Cheque, E-Cash, E-Payment Threats & Protections,
E-Marketing: Home – shopping, E-Marketing, Tele-Marketing
Electronic Data Interchange (EDI): Meaning, Benefits, Concepts, Application, EDI Model, protocols (UN EDI FACT / GTDI, ANSIX – 12, Data Encryption (DES / RSA)
Risk of E-Commerce: Overview, Security for E-Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital Certificates, Digital Signatures.

Module – IV **(10 Lectures)**

Enterprise Resource Planning (ERP): Features, capabilities and Overview of Commercial Software, re-engineering work processes for IT applications, Business Process Redesign , Knowledge Engineering and Data Warehouse.
Business Modules: Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials, Management, Quality Management Sales & Distribution ERP Package.
ERP Market: ERP Market Place, SAP AG, People Soft, BAAN, JD
Edwards, Oracle Corporation.
ERP-Present and Future: Enterprise Application Integration (EAI).
ERP and E-Commerce, ERP and Internet, Future Directions in ERP.

Reference Book:
1. E-Commerce, MM Oka, EPH
2. Kalakotia, Whinston: Frontiers of Electronic Commerce, Pearson Education.
3. Bhaskar Bharat : Electronic Commerce – Technologies & Applications, TMH
4. Loshin Pete, Murphy P.A.: Electronic Commerce, Jaico Publishing Housing

BCS-403 **DATA MINING & DATA WARE HOUSING (3-1-0)** **Cr.-04**

Module-I **(8 Lectures)**

Data Mining Functionalities – What Kinds of Patterns Can Be Mined? Classification of Data Mining Systems, Major Issues in Data Mining, Summary.

Data Warehouse and OLAP Technology for Data Mining – What is a Data Warehouse? Differences between Operational Database Systems and Data Warehouses, But, Why have a separate Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Steps for the Design and Construction of Data Warehouses, A Three-Tier Data Warehouse Architecture, Types of OLAP Servers: ROLAP versus MOLAP versus HOLAP, Data Warehouse Implementation, Efficient Computation of Data Cubes, Indexing OLAP Data, Efficient Processing of OLAP Queries, Metadata Repository, Data Warehouse Back-Eng Tools and Utilities, Further Development of Data Cube Technology, Discovery-Driven Exploration of Data Cubes, Complex Aggregation at Multiple Granularities: Multifeature Cubes, Other Developments, From Data Warehousing to Data Mining.

Modules-II (8 Lectures)

Data Preprocessing – Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives: What Defines a Data Mining Task? Task-Relevant Data, The Kind of Knowledge to be Mined, Background Knowledge: Concept Hierarchies, Interestingness Measures, Presentation and Visualization of Discovered Patterns, A Data Mining Query Language, Syntax for Task-Relevant Data Specification, Syntax for Specifying the Kind of Knowledge to be Mined, Syntax for Concept Hierarchy Specification, Syntax for Interestingness Measure Specification, Syntax for Pattern Presentation and Visualization Specification, Putting it All Together-An Example of a DMQL Query, Architectures of Data Mining Systems.

Module-III (12 Lectures)

Concept Description: Characterization and Comparison, What is Concept Description, Data Generalization and Summarization-Based Characterization, Attribute-Oriented Induction, Efficient Implementation of Attribute-Oriented Induction, Presentation of the Derived Generalization, Analytical Characterization: Analysis of Attribute Relevance, Why Perform Attribute Relevance Analysis? Methods of Attribute Relevance Analysis, Analytical Characterization: An Example, Mining Class Comparisons: Discriminating between Different Classes, Class Comparison Methods and Implementations, Presentation of Class Comparison Descriptions, Class Description: Presentation of Both Characterization and Comparison, Mining Descriptive Statistical Measures in Large Database, Measuring the Central Tendency, Measuring the Dispersion of Data, Graph Displays of Basic Statistical Class Descriptions.

Mining Association Rules in Large Databases, Association Rule Mining, Market Basket Analysis: A Motivating Example for Association Rule Mining, Basic Concepts, Association Rule Mining A Road Map, Mining Single-Dimensional Boolean Association Rules from Transactional Database, The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiently of Apriori, Mining Frequent Itemsets without Candidate Generation, Iceberg Queries, Mining Multilevel Association Rules from Transaction Databases, Multilevel Association Rules, Approaches to Mining Multilevel Association Rules, Checking for Redundant Multilevel Association Rules, Mining Multidimensional Association Rules for Relational Database and Data Warehouses, Multidimensional Association Rules, Mining Multidimensional Association Rules Using Static Discretization of Quantitative Attributes, Mining Quantitative Association Rules, Mining Distance-Based Association Rules, From Association Mining to Correlation Analysis, Strong Rules Are Not Necessarily Interesting: An Example, From Association Analysis to Correlation Analysis, Constraint-Based Association Mining, Metarule-Guide3d Mining of Association Rules, Mining Guided by Additional Rule Constraints.

Module-IV (12 Lectures)

Classification and Prediction – What is Classification? What Is Prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Decision Tree Induction, Tree Pruning, Extracting Classification Rules from Decision Trees, Enhancements to Basic Decision Tree Induction, Scalability and Decision Tree Induction, Integrating Data Warehousing Techniques and Decision Tree Induction, Bayesian Classification, Bayes Theorem, Naïve Bayesian Classification, Bayesian Belief Networks, Training Bayesian Belief Networks, Classification by Backpropagation, A Multilayer Feed-Forward Neural Network, Defining a Network Topology, Classification Based of Concepts from Association Rule Mining, Other Classification Methods, k-Nearest Neighbor Classifiers, Case-Based Reasoning, Genetic Algorithms, Rough Set Approach, Fuzzy Set Approachs, Prediction, Linear and Multiple Regression, Nonlinear Regression, Other Regression Models, Classifier Accuracy, Estimating Classifier Accuracy, Increasing Classifier Accuracy, Is Accuracy Enough to judge a Classifier.
Cluster Analysis – What Is Cluster Analysis, Types of Data in Cluster Analysis, Interval-Scaled Variables, Binary Variables, Nominal, Ordinal, and Ratio-Scaled Variables, Variables of Mixed Types, A Categorization of Major Clustering Methods, Classical Partitioning Methods: k-Means and k-Medoids, Partitioning Methods in Large Databases: From k-Medoids to CLARANS, Hierarchical Methods, Agglomerative and Divisive Hierarchical Clustering, BIRCH: Balanced Iterative Reducting and Clustering Using Hierarchies, CURE: Clustering Using Representatives, Chameleon: A Hierarchical Clustering Algorithm Using Dynamic Modeling, Density-Based Methods, DBSCAN: A Density-Based Clustering Method Based on Connected Regions with Sufficiently High Density, OPTICS: Ordering Points To Identify the Clustering Structure, DENCLUE: Clustering Based on Density Distribution Functions, Grid-Based Methods, STING: Statistical Information Grid, Wave Cluster: Clustering Using Wavelet Transformation, CLIQUE: Clustering High-Dimensional Space, Model-Based Clustering Methods, Statistical Approach, Neural Network Approach.

Module-V (10 Lectures)
Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Generalization of Structured Data Aggregation and Approximation in Spatial and Multimedia Data Generalization of Object Identifiers and Class/Subclass Hierarchies, Generalization of Class Composition Hierarchies, Construction and Mining of Object Cubes, Generalization-Based Mining of Plan Databases by Divide-and-Conquer, Mining Spatial Databases, Spatial Data Cube Construction and Spatial OLAP, Spatial Association Analysis, Spatial Clustering Methods, Spatial Classification and Spatial Trend Analysis, Mining Multimedia Databases, Similarity Search in Multimedia Data, Multidimensional Analysis of Multimedia Data, Classification and Prediction Analysis of Multimedia Data, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web.
Applications and Trends in Data Mining – Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining, Social Impacts of Data Mining, Trends in Data Mining.

BOOKS:

1. Data Mining: – Concepts and Techniques by Jiawei Han and Micheline Kamber, -- Morgan Kaufmann Publisher (Elseviers)
2. Data Mining Techniques: - by A.K. Pujari,, Tenth Edition, Universities Press.

BCS-404 ARTIFICIAL INTELLIGENCE (3-1-0) Cr.-04

Module - I (10 Lectures)

Formalized symbolic logic: Propositional logic-first order predicate logic, wff conversion to clausal form, inference rules, the resolution principle, Dealing with inconsistencies and uncertainties, fuzzy logic.

Module - II **(10 Lectures)**

Probabilistic Reasoning Structured knowledge, graphs, frames and related structures, Knowledge organization and manipulation.

Module – III **(10 Lectures)**

Matching Techniques, Knowledge organizations, Management.

Module - IV **(10 Lectures)**

Natural Language processing, Pattern recognition, expert systems.

Text Book:

1. Artificial Intelligence, Dan W Patterson, Prentice Hall of India (1999) Chapter-4, 5,7,9,10,11,12,13,15.

Reference Books:

1. Artificial Intelligence, Nils J.Nilsson, ELSEVIER.
2. E.Rich and K.Knight, Artificial Intelligence, - TMH

BCS-405 **SOFT COMPUTING (3-1-0)** **Cr.-4**

Module I **(10 Lectures)**

Neural Networks: Fundamentals of Neural Networks: Models of an artificial Neuron, Neural Network Architecture, Learning methods

Back Propagation Networks: Architecture of a Back propagation Network: back propagation, Learning Effect of Tunning parameters of the Back propagation Neural Network, variation of standard Back Propagation Algorithms.

Module II **(10 Lectures)**

Associative memory: Auto correlators, Kosko's Discrete BAM, Exponential BAM, Associative memory for Real-coded Pattern Pairs, Applications.

Adaptive Resonance Theory:
ART1, ART2, Applications

Module III **(10 Lectures)**

Fuzzy Logic:

Fuzzy set theory: crisp sets, fuzzy sets, crisp relations, fuzzy relations, Fuzzy Systems: Crisp logic predicate logic, fuzzy logic, fuzzy Rule based system, Defuzzification Methods.

Genetic Algorithms:
Fundamentals of genetic algorithms: Encoding, Fitness functions, Reproduction.
Genetic Modeling:
Cross cover, Inversion and deletion, Mutation operator, Bit-wise operators, Bitwise operators used in GA. Convergence of Genetic algorithm. Applications, Real life Problems.

Module IV **(10 Lectures)**

Hybrid Systems:
Hybrid system, neural Networks, fuzzy logic and genetic algorithms hybrids.
Genetic Algorithm based Back propagation Networks: GA based weight determination applications: Fuzzy Back Propagation Networks, Fuzzy Associative Memories: Single Association FAM, Fuzzy Hels FAMS, Fuzzy logic controlled genetic Algorithms soft computing tools, Fuzzy constraints, GA in fuzzy logic controller design, Applications.

Text Books:

1. Neural Networks, Fuzzy Logic, and Genetic Algorithm (Synthesis and Application) S.Rajasekaran, G.A. Vijayalakshmi Pai, PHI

Reference Book:

1. Neuro Fuzzy and Soft Computing, J.S.R.JANG, C.T.Sun, E.Mitzutani, PHI

BCS 406 **DISTRIBUTED COMPUTING (3-1-0)** **Cr.-4**

Module – I **(10 Lectures)**

Definition of a Distributed System: Making Resources Accessible, Distribution Transparency, Openness, Scalability, Pitfalls, Types of Distributed Systems; Distributed Computing Systems, Distributed Information Systems, Distributed Pervasive Systems.
Architectures: Architectural Styles; System Architectures, Centralized Architectures, Decentralized Architectures, Hybrid Architectures, Architectures Versus Middleware; Interceptors, General Approaches to Adaptive Software, Discussion, Self-Management in Distributed Systems; The Feedback Control Model, Systems Monitoring with Astrolabe, Differentiating Replication Strategies in Globule, Automatic Component Repair Management in Jade.

Module – II **(10 Lectures)**

Processes: Threads; Introduction to Threads, Threads in Distributed Systems, Virtualization; The Role of Virtualization in Distributed Systems, Architectures of Virtual Machines, Clients; Networked User Interfaces, Client-Side Software for

Distribution Transparency, Servers; General Design Issues, Server Clusters, Managing Server Clusters, Code Migration; Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems.

Communication: Fundamental; Layered Protocols, Types of Communication, Remote Procedure Call; Basic RPC Operation, Parameter passing, Asynchronous RPC, DCE RPC, Message-Oriented Communication; Message-Oriented Transient Communication, Message-Oriented Persistent Communication, Stream-Oriented Communication; Support for Continuous Media, Streams and Quality of Service, Stream Synchronization, Multicast Communication; Application-Level Multicasting, Gossip-Based Data Dissemination.

Module – III (10 Lectures)

Naming: Names, Identifiers and Addresses; Flat Naming; Simple Solutions, Home-Based Approaches, Distributed Hash Tables, Hierarchical Approaches, Structured naming; Name Spaces, Name Resolution, The Implementation of a Name Space, Attribute-Based Naming; Directory Services, Hierarchical Implementations: LDAP, Decentralized Implementations,

Synchronization: Clock Synchronization; Physical Clocks, Global Positioning System, Clock Synchronization Algorithms, Logical Clocks; Lamport's Logical Clocks, Vector Clocks, Mutual Exclusion; Overview, A Centralized Algorithm, A Decentralized Algorithm, A Distributed Algorithm, A Token Ring Algorithm, A Comparison of the Four Algorithms, Global Positioning of Nodes; Election Algorithms; Traditional Election Algorithms, Elections in Wireless Environments, Election in Large-Scale Systems.

Module – IV (10 Lectures)

Consistency and Replication: Introduction; Reasons for Replication, Replication as Scaling Technique, Data-Centric Consistency Models; Continuous Consistency, Consistent Ordering of Operations, Client-Centric consistency Models; Eventual Consistency, Monotonic Reads, Monotonic Writes, Read Your Writes, Writes Follow Reads, Replica Management; Replica-Server Placement, content Replication and Placement, Content Distribution, Consistency Protocols; Continuous Consistency, Primary-Based Protocols, Replicated-Write Protocols, Cache-Coherence Protocols, Implementing Client-Centric Consistency.

Security: Introduction to Security; Security Threats, Policies, and Mechanisms, Design Issues, Cryptography, Secure Channels; Authentication, Message Integrity and Confidentiality, Secure Group Communication, Access Control; General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of service, Security Management; Key Management, Secure Group Management, Authorization Management.

Reference Books:

1) Distributed Systems, 2nd Edition by Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall.

BCS-417 ADVANCED OPERARTING SYSTEM (3-1-0) Cr-4

Fundamentals: What is a Distributed computing system , Evolution of Distributed Computing Systems, Distributed Computing Systems models, What are Distributed Computing Systems Gaining Popularity, What is a Distributed Operating Systems, Issues in Designing a Distributed Operating System, Introduction to distributed Computing Environment (DCE) .

Message Passing : Introduction, Desirable Features of Good Message-Passing System, Isses in IPC by Message Passing, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing , Failure Handling , Group communication.

Remote Procedure Calls:- Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics , Call Semantics, Communication protocols for RPCs. Complicated RPCs, Client-Server Binding, Exception handling, Security, Some Special types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC,

Distributed Shared Memory: Introduction, General Architecture of DSM Systems, Design and Implementation issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing , Other Approaches to DSM, Heterogeneous DSM, Advantages of DSM,

Synchronization: Introduction, Clock Synchronization , Event ordering, Mutual Exclusion, Deadlock, Election Algorithms.

Resources Management : Introduction , Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load Balancing Approach, Load sharing Approach

Process Management: Introduction, Process Migration, Threads

Distributed file Systems: Introduction, Desirable Features of a good Distributed file Systems, File Models, File Accessing Models, File-Sharing Semantics, File-Caching Schemes, File Replication, fault Tolerance, Atomic Transactions, Design principles,

Naming: Introduction, Desirable Features of a Good Naming Systems, Fundamentals Terminologies and Concepts, System-Oriented Names, Object-Locating Mechanisms, Human-Oriented Names, Name Caches, Naming and Security,

Security: Introduction, Potential Attacks to Computer Systems, Cryptography, Authentication, Access control, Digital Signatures, Design principles,

Text Books:

1. Distributed Operating System – Concept & Design, by – P.K.Sinha, PHI

Reference Books:

1. Operating System Concepts & Design, Milan Milenkovic, TMH
2. Operating System, H.M.Beitel, Pearsons

BCS-408 **MODELING & SIMULATION (3-1-0)** **Cr.-4**

Module I **(10 Lectures)**

Inventory Concept: The technique of Simulation, Major application areas, concept of a System, Environment, Continuous and discrete systems, systems modeling types of models progress of a Simulation Study, Monte Carlo Method, Comparison of Simulation and Analytical Methods. Numerical Computation Technique for discrete and continuous models, Continuous System Simulation.

Module II **(10 Lectures)**

Probability Concepts in Simulation: Stochastic variables, Discrete and Continuous Probability Functions, Numerical evaluation of continuous probability functions, continuous uniformly distributed random numbers, Random Number Generators – Linear congruential Generator, Mid Square Method, Multiplicative Congruential generator, rejection Method, Testing of random Numbers, Generation of Stochastic variates, Arrival Patterns Service times.

Module III **(10 Lectures)**

Discrete System Simulation and GPSS: Discrete Events, Representation of Time, generation of arrival patterns, fixed time step versus next event simulation, Simulation of a Telephone System, delayed calls. Introduction to GPSS: Creating and moving transactions, queues, facilities and storages, gathering statistics, conditional transfers, program control statements, priorities and parameters, standard numerical attributes, functions, gates, logic switches and tests, Variables, Select and Count.

Module IV **(10 Lectures)**

Simulation Languages and Practical Systems: Continuous and discrete systems languages, factors in the section of discrete systems simulation language. Computer model of queuing, inventory and scheduling systems. Design and Evaluation of simulation Experiments: Length of simulation runs, validation, variance reduction techniques, experimental layout, analysis of simulation output, Recent trends and developments.

Books:

1. System Simulation – Geoffrey Gordon, 2nd Edition, PHI
2. System Simulation with Digital computer – Narsingh Deo, PHI

8th SEMESTER

BCS 411 **ADVANCED COMPUTER ARCHITECTURE (3-1-0) Cr.-4**

Module-I **(10 lectures)**

Parallel Processing**:** Definition, Theory of Parallelism. Parallel Computer Models, Parallelism in Uni-processor computers, Implicit Parallelism vs. explicit parallelism, Levels of parallelism.Soft ware Parallelism, Hardware Parallelism.

Conditions of Parallelism: Data and Resource Dependencies, Control Dependence, Resource dependence, Berrnstein's condition, Hardware and software parallelism, Flow dependence, Anti dependence, output dependence, I/O dependence, unknown dependence.

Module-II **(10 lectures)**

Program flow Mechanism: Control flow versus data flow, Demand-driven mechanism, Comparison of flow mechanisms, Dataflow computer Architecture, Static dataflow and dynamic dataflow computer, Communication Latency, grain packing and scheduling in parallel programming environment, program partitioning, fine grain program, coarse grain program graph.

Module-III **(10 lectures)**

Parallel Interconnection Systems: Static and Dynamic Networks, Linear Array, Ring, Star, Tree, Mesh, Systolic Array, Chordal ring, Completely connected network, Cube connected cycles, Torus, K-ary-n cube, Barrel shifter, single stage interconnection network, Multistage Interconnection Networks, Control Structure, Node degree, diameter, Bisection width, symmetric, functionality, Network Latency, Bandwidth, Scalability, Data routing functions:- Permutation, Perfect shuffle exchange, Hypercube Routing function.

Pipelining: Linear pipe line processor, Asynchronous and Synchronous models, speed up, Efficiency, Throughput, Non linear pipe line processor, Instruction pipeline, pipeline hazards, Arithmetic pipeline.

Module-IV **(10 lectures)**

Multiprocessor and multicomputers: Hierarchical bus system, crossbar and multi port memory, cross point switch, Flynn's classification: SISD, SIMD, MISD, MIMD, message passing, Loosely coupled and tightly coupled system.

Vector processor, memory hierarchy, CISC scalar processor, RISC scalar processor, C-access and S-access memory organization. Basic ideas on parallel algorithm, SIMD algorithm for matrix multiplication.

Fault-tolerance and reliability, Availability, System Performance attributes of parallel Computers.

Text Books:

1. Advanced Computer Architecture, by Kai Hwang Mc Graw Hill.
2. Introduction to Parallel Computing, 2nd Edition, Pearson Education by Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar.

Reference Books:

1. Computer Architecture – A quantitative approach By J.L Hennessy and D.A.Patterson (Morgan)
2. Computer Architecture and Parallel Processing, by K.Hwang and F.A. Briggs. Mc Graw Hill, International

BIT 401 **MOBILE COMPUTING (3-1-0)** **Cr.-4**

Module – I **(10 Lectures)**

Introduction to Personal Communications Services (PCS): PCS Architecture, mobility management, Networks signaling, Global System for Mobile Communication (GSM) System overview: GSM Architecture, Mobile management, Network signaling.
General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; WLANs (Wireless LANs), IEEE 802.11 standards, Mobile IP.

Module – II **(10 Lectures)**

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

Module – III **(10 Lectures)**

Global Mobile Satellite Systems: case studies of the IRIDIUM and GLOBALSTAR systems. Wireless Enterprise Networks: Introduction to Virtual Networks,VPN, Blue tooth technology, Blue tooth Protocols, Mobile adhoc networks.

Module – IV **(10 Lectures)**

Server-side programming in Java, Pervasive web application architecture, Device Independent example application.

Text Book:

1. Mobile computing, Talukder, TMH, 2010.
2. “Mobile Communication”, J.Schiller, Pearson, 2010.

Reference Book:

1. “Guide to Designing and Implementing Wireless LANs”, Mark Ciampa, Thomson learning, Vikas Publishing House, 2001
2. “Wireless Web Development”, Ray Rischpater, Springer Publishing
3. “The Wireless Application Protocol”, Sandeep Singhal, Pearson
4. “Third Generation Mobile Telecommunication Systems”, by P.Stavronlakis, Springer Publishers.
5. “Pervasive Computing”, Burkhardt, Pearson

BIT-414 **BIO INFORMATICS (3-1-0)** **Cr.-4**

Module - I **(10 Lectures)**

Introduction to Genomic data and Data Organization: Sequence Data Banks – introduction to sequence data banks – protein sequence data bank. NBFR-PIR. SWISSPORT. Signal peptide data bank, Nucleic acid sequence data bank – GenBank, EMBL nucleotide sequence data bank. AIDS virus sequence data bank. PRNA data bank, structural data banks- protein Data Bank (PDB). The Cambridge Structural Database (CSD) : Genome data bank – Metabolic pathway data; Microbial and Cellular Data Bank.

Module - II **(10 Lectures)**

Introduction to MSDN (Microbial Strain Data Network) : Numerical Coding Systems of Microbes, Hibridoma Data Bank Structure, Virus Information System Cell line information system; other important Data banks in the area of biotechnology/life sciences/biodiversity.

Sequence analysis: Analysis Tools for Sequence Data Bank: Pair wise alignment – NEEDLEMAN and Wunsch algorithm, Smith Waterman, BLAST, FASTA algorithms to analyze sequence data; Sequence patterns motifs and profiles.

Module - III **(10 Lectures)**

Secondary Structure Predictions; prediction algorithms; Chao-Fasman algorithm. Hidden-Markov model, Neural Networking.

Tertiary Structure predictions; prediction algorithms; Chao-Fasman algorithm. Hidden-Markov model, Neural Networking.

Module- IV **(10 Lectures)**

Application in Biotechnology : Protein classifications, Fold libraries, Protein structure prediction : Fold recognition's (threading), protein structure predictions : Comparative modeling (Homology), Advanced topics : Protein folding, Protein-ligand interactions, Molecular Modeling & Dynamics, Drug Designing.

Text Books:

1. Lesk, Introduction to Bio Informatics, OUP
2. Introduction to Bio-informatics, Atwood, Pearson Education
3. Developing Bio-informatics Computer Skills, Cynthia Gibas andd Per Jambeck. 2001 SPD
4. Murty CSV, Bioinformatics, Himalaya

BEC-418 **VLSI DESIGN (3-1-0)** **Cr.-4**

Module – I **(10 Lectures)**

Introduction, Historical perspective, VLSI Design methodologies, VLSI Design Flow, Design Hierarchy, Design Styles, CAD Technology. Fabrication of MOSFETS, Fabrication processes, NMOS Fabrication, CMOS n-well process, Layout Design rules, Stick Diagrams, Full Custom Mark Layout Design, MOS Transistor, Review of structure and operation of MOSFET (n-MOS enhancement type), CMOS, MOSFET v-I characteristics, MOSFET scaling and small geometry effects, MOSFET capacitances, Modeling of MOS Transistors – Basic concept the SPICE level-1 models, the level-2 and level-3 model equations.

Module – II **(10 Lectures)**

MOS Inverters: Basic NMOS Inverters, characteristics, Inverters with resistive load and with n-type MOSFET load, CMOS Inverter and characteristics.

MOS inverters: Switching characteristics and interconnect effects: Delay time definitions and calculation, inverter design with delay constrains, estimation of parasitic switching power of CMOS inverters.

Module – III **(10 Lectures)**

Combinational MOS logic circuits, CMOS logic circuits, state style, complex logic circuits, pass transistor logic, sequential logic circuit – introduction, SR latch, clocked latch and flip-flop circuits, CMOS D latch and edge triggered flip-flop.

Dynamics logic circuits: Dynamic logic, basic principles, high performance dynamics CMOS circuits, Dynamic Ram, SRAM, flash memory.

Module – IV **(10 Lectures)**

Systems Design method, design strategies, concept of FPGA, standard cell based design, design capture tools, hardware definition languages such as VHDL and packages. Xlinx (Introduction), introduction to IRSIM and GOSPL (open source packages), design verification and testing, simulation at various levels including timing verification, faults models, Design strategies for testing chip level and system level test techniques.

Text Books:

1. CMOS Digital integrated Circuits – Analysis & Design – Sung Mo-Kang & Yussuf Leblebici, TMH.
2. VHDL Programming by example – Perry TMH.
3. Digital Integrated Circuit, J.M.Rabey, Chandrasan, Nicolic, Pearson

4. CMOS Digital Integrated Circuit, B.M.Kang & Leblebici, TMH
5. Modern VLSI Design, Wayne Wolf, Pearson
6. Algorithm for VLSI Design and Automation, N.Sherwani, Kluwer
7. VHDH, Bhaskar, PHI

Reference Books:

1. Digital Integrated Circuits: A Design Perspective – Rabey et.al. Pearson Education.
2. VLSI design Techniques for analog and digital circuits- Geiger et. Al. McGraw Hill.

BCS-417 **ADVANCED OPERARTING SYSTEM (3-1-0)** **Cr-4**

Module-I **(12 Lectures)**

Fundamentals: What is a Distributed computing system , Evolution of Distributed Computing Systems, Distributed Computing Systems models, What are Distributed Computing Systems Gaining Popularity, What is a Distributed Operating Systems, Issues in Designing a Distributed Operating System, Introduction to distributed Computing Environment (DCE) .

Message Passing : Introduction, Desirable Features of Good Message-Passing System, Isses in IPC by Message Passing, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing , Failure Handling , Group communication.

Remote Procedure Calls:- Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics , Call Semantics, Communication protocols for RPCs. Complicated RPCs, Client-Server Binding, Exception handling, Security, Some Special types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC,

Module-II **(8 Lectures)**

Distributed Shared Memory: Introduction, General Architecture of DSM Systems, Design and Implementation issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing , Other Approaches to DSM, Heterogeneous DSM, Advantages of DSM,

Module-III **(10 Lectures)**

Synchronization: Introduction, Clock Synchronization , Event ordering, Mutual Exclusion, Deadlock, Election Algorithms.

Resources Management : Introduction , Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load Balancing Approach, Load sharing Approach

Process Management: Introduction, Process Migration, Threads

Module-IV **(10 Lectures)**

Distributed file Systems: Introduction, Desirable Features of a good Distributed file Systems, File Models, File Accessing Models, File-Sharing Semantics, File-Caching Schemes, File Replication, fault Tolerance, Atomic Transactions, Design principles,

Naming: Introduction, Desirable Features of a Good Naming Systems, Fundamentals Terminologies and Concepts, System-Oriented Names, Object-Locating Mechanisms, Human-Oriented Names, Name Caches, Naming and Security,

Security: Introduction, Potential Attacks to Computer Systems, Cryptography, Authentication, Access control, Digital Signatures, Design principles,

Text Books:

1. Distributed Operating System – Concept & Design, by – P.K.Sinha, PHI

Reference Books:

1. Operating System Concepts & Design, Milan Milenkovic, TMH
2. Operating System, H.M.Beitel, Pearsons

BCS 428 **KNOWLEDGE MANAGEMENT (3-1-0)** **Cr.-4**

Module – I **(10 Lectures)**

Principles and Case Studies:

Overview of Knowledge Management, The Nature of Knowledge, Knowledge Management Solutions, Organizational Impacts of Knowledge Management, Factors Influencing Knowledge management, Knowledge Management Assessment of an Organization.

Module - II **(10 Lectures)**

Technologies:

Technologies to Manage Knowledge: Artificial Intelligence, Digital Libraries, Repositories, etc., Preserving and Applying Human Expertise: Knowledge-Based Systems, Using Past History Explicitly as Knowledge: Case-Based Systems, Knowledge

Elicitation: Converting Tacit Knowledge to Explicit, Discovering New Knowledge: Data Mining

Text KM and Text Mining.

Module - III **(10 Lectures)**

Systems:

Knowledge Discovery: Systems that Create Knowledge, Knowledge Capture Systems: Systems that Preserve and Formalize Knowledge; Concept Maps, Process Modeling, RSS, Wikis, Delphi Method, etc., Knowledge Sharing Systems: Systems that Organize and Distribute Knowledge; Ontology Development, Systems, Categorization and Classification Tools, XML-Based Tools, etc., Knowledge Application Systems: Systems that Utilize Knowledge.

Module – IV **(10 Lectures)**

Advanced Topics:

Knowledge Engineering, Knowledge Ecosystems, Meta Knowledge, Knowledge Management Softwares

The Future of Knowledge Management.

Textbook:

1. Irma Becerra-Fernandez, Avelino Gonzalez, Rajiv Sabherwal (2004). *Knowledge Management Challenges, Solutions, and Technologies* (edition with accompanying CD). Prentice Hall. ISBN: 0-13-109931-0.

Reference books/materials:

1. Elias M. Awad, Hassan M. Ghaziri (2004). *Knowledge Management*. Prentice Hall. ISBN: 0-13-034820-1.
2. Ian Watson (2002). *Applying Knowledge Management: Techniques for Building Corporate Memories*. Morgan Kaufmann. ISBN: 1558607609.
3. Madanmohan Rao (2004). *Knowledge Management Tools and Techniques: Practitioners and Experts Evaluate KM Solutions*. Butterworth-Heinemann. ISBN: 0750678186.
4. Amrit Tiwana (2002). *The Knowledge Management Toolkit: Orchestrating IT, Strategy, and Knowledge Platforms* (2nd Edition). Prentice Hall. ISBN: 013009224X.
5. Stuart Barnes (ed) (2002). *Knowledge Management Systems Theory and Practice*. Thomson Learning.

BCS430 REINFORCEMENT LEARNING (3-1-0) Cr. 04

Module-I **(8 Lectures)**

The Reinforcement Learning problem: evaluative feedback, non-associative learning, Rewards and returns, Markov Decision Processes, Value functions, optimality and approximation

Dynamic programming: value iteration, policy iteration, asynchronous DP, generalized policy iteration

Module-II **(8 Lectures)**

Monte-Carlo methods: policy evaluation, roll outs, on policy and off policy learning, importance sampling

Temporal Difference learning: TD prediction, Optimality of TD(0), SARSA, Q-learning, R-learning, Games and after states

Module-III **(8 Lectures)**

Eligibility traces: n-step TD prediction, TD(lambda), forward and backward views, Q(lambda), SARSA(lambda), replacing traces and accumulating traces

Function Approximation: Value prediction, gradient descent methods, linear function approximation, ANN based function approximation, lazy learning, instability issues

Module-IV **(8 Lectures)**

Policy Gradient methods: non-associative learning - REINFORCE algorithm, exact gradient methods, estimating gradients, approximate policy gradient algorithms, actor-critic methods

Planning and Learning: Model based learning and planning, prioritized sweeping, Dyna, heuristic search, trajectory sampling, E^3 algorithm

Module-V **(8 Lectures)**

Hierarchical RL: MAXQ framework, Options framework, HAM framework, airport algorithm, hierarchical policy gradient

Case studies: Elevator dispatching, Samuel's checker player, TD-gammon, Acrobot, Helicopter piloting

Text Books

1. R. S. Sutton and A. G. Barto: "Reinforcement Learning: An Introduction". Cambridge, MA: MIT Press, 1998.

References

1. "Neuro-dynamic programming". Dimitri P. Bertsikas and John N. Tsitsiklis.
2. "Learning Automata - An Introduction". Kumpati S. Narendra and M. A. L. Thathachar.