Semester No: 3
Theory:

Tentative Sub Code	Course Title	L	T	P	C
BCS1201	Data Structures & Algorithms	3	0	0	3
BCS1202	Introduction to OOPS with C++ and Java	3	0	0	3
BMA3007	Discrete Mathematics	3	1	0	4
BCS1203	Computer Graphics & Multimedia	3	1	0	4
BEC12x1	Electrical and Electronic devices	3	1	0	4
BEC12x2	Digital Electronics	3	0	0	3

Practical:

BCSL1201	Data Structures Using C++ Lab	0	0	3	1
BCSL1202	Java Lab	0	0	3	1
BECL12x1	Digital Electronics lab	0	0	3	1

Total Hrs : 30 per week
Credits Sub Total: 24

Semester No: 4
Theory:

Tentative Sub Code	Course Title	L	T	P	C
BCS1204	Data Base Management Systems	3	0	0	3
BCS1205	Software Engineering	3	1	0	4
BCS1206	Operating System	3	0	0	3
BMA3012	Probability and Linear Programming	3	1	0	4
BEC12x3	Communication systems	3	0	0	3
BEC12x4	Microprocessors And Micro Controllers	3	0	0	3

Practical:

BCSL1203	DBMS Lab	0	0	3	1
BCSL1204	Operating System Lab	0	0	3	1
BECL12x2	Microprocessors Lab and Peripheral Interfacing Lab	0	0	3	1

Total Hrs: 29 per Week

Credits Sub Total: 23

Semester No: 5

Theory:

Tentative Sub Code	Course Title	L	T	P	C
BCS1207	System Software	3	0	0	3
BCS1208	Computer Architecture	3	0	0	3
BMA3018	Numerical Methods and Optimisation Techniques	3	1	0	4
BCS1210	Object Oriented System Analysis and Design	3	0	0	3
BCS1211	Artificial Intelligence	3	1	0	4
BCS1212	Computer Networks	3	0	0	3

Practical:

BCSL1206	System software lab	0	0	3	1
BCSL1207	Software System Development Lab	0	0	3	1
BCSL1208	Network Programming Lab	0	0	3	1
BCSA1201	Career & Confidence Building (SOFT SKILLS – I)	0	2	0	2

Total Hrs 29 per Week
Credits Sub Total : 25

Semester No: 6

Theory:

Tentative Sub Code	Course Title	L	T	P	C
BCS1209	Modelling and Simulation for Engineers	3	0	0	3
BCS1213	Principles of Compiler Design	3	0	0	3
BCS1214	Web Technology	3	0	0	3
BCS1215	Advanced Java Programming	3	1	0	4
BCSE 1211/1221/ 1231/1241/ 1251/1261/ 1271/1281/ 1291/12A1	Elective I	3	0	0	3

BCSE 1212/1222/ 1232/1242/ 1252/1262/ 1272/1282/ 1292/12A2	Elective II	3	0	0	3

Practical:

BCSL1205	Modelling and Simulation Lab	0	0	3	1
BCSL1209	Compiler Design Lab	0	0	3	1
BCSL1210	Value Added Training Programme / Three Tier Application Project	0	0	2	1
BCSL1211	Web Technology Lab	0	0	3	1
BCSA1202	Qualitative / Quantitative Skills (**Soft Skills – II**)	0	1	1	2

Total Hrs. 30   Per Week
Credits SubTotal: 25

Semester No: 7
Theory :

Tentative Sub Code	COURSE TITLE	L	T	P	C
BCS1216	**.** Net Framework	3	0	0	3
BCS1217	Data Warehousing and Data Mining	3	1	0	4
BMG12x1	Principles of Management	3	1	0	4
BCSE 1213/1223/ 1233/1243/ 1253/1263/ 1273/1283/ 1293/12A3	Elective III	3	0	0	3
BCSE 1214/1224/ 1234/1244/ 1254/1264/ 1274/1284/ 1294/12A4	Elective IV	3	0	0	3

Practical :

BCSL1212	. Net Lab	0	0	3	1
BCSL1213	Comprehension / Foreign Language Certification	0	2	0	2
BCSL1214	Project (Phase – I)	0	1	3	2
BCSL1215	Free and Open Source Software (Foss) Lab	0	1	3	1

Total Hrs 30 Per Week
Credits Sub Total: 23
Semester No: 8

Semester No: 8
Theory:

Tentative Sub Code	COURSE TITLE	L	T	P	C
BMG12x2	Entrepreneurship Development	3	1	0	4
BCS1218	Information Storage Management	3	0	0	3
BCSE 1215/1225/ 1235/1245/ 1255/1265/ 1275/1285/ 1295/12A5	Elective V Or Special Elective –I	3	0	0	3
BCSE 1216/1226/ 1236/1246/ 1256/1266/ 1276/1286/ 1296/12A6	Elective VI Or Special Elective – II	3	0	0	3

Practical:

BCSL1216	Project (Phase – II)	0	0	12	6

Total Hrs : 16 Per Week
8th Sem Credits Subtotal : 19

Summary of credits for the course
3rd Sem Credits: 24 (30hrs)
4th Sem Credits: 23 (29hrs)
5th Sem Credits: 25 (30hrs)
6th Sem Credits: 25 (30hrs)
7th Sem Credits: 23 (30hrs)
8th Sem Credits: 19 (16hrs)

Total Credits: **139**
From Ist year credits **45**
At the end of the course Total credits to be earned is **184**

LIST OF ELECTIVES

I. DATABASE SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1211	Database Tuning	3	0	0	3
BCSE1212	Advanced Knowledge Management	3	0	0	3
BCSE1213	Infometrics	3	0	0	3
BCSE1214	Enterprise Application Integration	3	0	0	3
BCSE1215	Web Data Design & Management	3	0	0	3
BCSE1216	Advanced Databases	3	0	0	3

II. NETWORKING SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1221	Mobile and Wireless Networks	3	0	0	3
BCSE1222	Tcp/IP Design and Implementation	3	0	0	3
BCSE1223	Ad-hoc Networks	3	0	0	3
BCSE1224	3G-Networking	3	0	0	3
BCSE1225	Network Security and Cryptography	3	0	0	3
BCSE1226	Pervasive Computing	3	0	0	3

III. OS SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1231	Unix Internals	3	0	0	3
BCSE1232	Distributed Computing	3	0	0	3
BCSE1233	Real Time System Design	3	0	0	3
BCSE1234	Advanced Operating System	3	0	0	3
BCSE1235	Parallel Processing	3	0	0	3
BCSE1236	Fault Tolerance System	3	0	0	3

IV. COMPUTATIONAL THEORY SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1241	Design of Algorithms	3	0	0	3
BCSE1242	Optimisation Techniques	3	0	0	3
BCSE1243	Theory of Computation	3	0	0	3
BCSE1244	Algorthmic graph Theory	3	0	0	3
BCSE1245	Principles of Programming Languages	3	0	0	3
BCSE1246	Natural Language Processing	3	0	0	3

V. VLSI & EMBEDDED SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1251	VLSI Technology	3	0	0	3
BCSE1252	System Modeling Using Hardware Description Languages	3	0	0	3
BCSE1253	VLSI Design	3	0	0	3
BCSE1254	Computer Aided Design of VLSI	3	0	0	3
BCSE1255	Embedded System Design	3	0	0	3
BCSE1256	Micro Controller Architecture & Design	3	0	0	3

VI.- BIOINFORMATICS SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1261	Bio Informatics	3	0	0	3
BCSE1262	Biological Databases and Data Analysis	3	0	0	3
BCSE1263	Cell Biology and Genetics	3	0	0	3
BCSE1264	Programming in PERL	3	0	0	3
BCSE1265	Machine Learning Models in Bio Informatics	3	0	0	3

| BCSE1266 | Advance Techniques for Sequence and Structure Analysis | 3 | 0 | 0 | 3 |

VII. DIGITAL IMAGE PROCESSING SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1271	Digital Image Processing	3	0	0	3
BCSE1272	Pattern Recognition and Neural Networks	3	0	0	3
BCSE1273	Medical Imaging Techniques	3	0	0	3
BCSE1274	Digital Image Processing Algorithms	3	0	0	3
BCSE1275	Intelligent Image Databases	3	0	0	3
BCSE1276	Geographical Information System	3	0	0	3

VIII..ARTIFICIAL INTELLIGENCE SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1281	Software Agents	3	0	0	3
BCSE1282	Knowledge Engineering	3	0	0	3
BCSE1283	Parallel Algorithms	3	0	0	3
BCSE1284	Speech Processing	3	0	0	3
BCSE1285	Soft Computing	3	0	0	3
BCSE1286	Machine Learning	3	0	0	3

IX. HARDWARE SPECIALISATION

Tentative Sub Code	Course Title	L	T	P	C
BCSE1291	Digital Signal Processing	3	0	0	3
BCSE1292	Advanced Computer Architecture	3	0	0	3
BCSE1293	Robotics	3	0	0	3
BCSE1294	Multi Core Architecture and Programming	3	0	0	3
BCSE1295	Special Elective – I	3	0	0	3
BCSE1296	Special Elective – II	3	0	0	3

X. SOCIETAL ELECTIVES

Tentative Sub Code	Course Title	L	T	P	C
BCSE12A1	Disaster Management	3	0	0	3
BCSE12A2	Professional Ethics	3	0	0	3
BCSE12A3	Economics for Engineers	3	0	0	3
BCSE12A4	Social Computing (Web 2.0)	3	0	0	3
BCSE12A5	Global Strategy and Technology	3	0	0	3
BCSE12A6	Human Values and Human Rights	3	0	0	3

Note: The Stream based electives B.Tech – IT can also be offered to B.Tech – CSE Students.

BCSC1201	DATA STRUCTURES AND ALGORITHMS	3	0	0	3

Unit I   Linear Data Structures   9 0 0

Stacks, Queues Implementation and Applications, Singly linked list-Doubly linked Lists-circular linked list- Applications

Unit II   Nonlinear Data Structures   9 0 0

Trees – Binary Trees – Binary Search Tree Implementation – Tree Traversals – AVL Trees

Unit III   Algorithm Analysis   9 0 0

Sorting and searching –space complexity-time complexity Linear & Binary Searching analysis-Quick sort-Heap sort-Merge sort-selection sort- RADIX   sort-bubble sort-Insertion sort-shell sort-Analysis

Unit IV   Graph algorithms   9 0 0

Graph   operations-DFS-BFS-Minimum   cost   spanning   tree-Krushkal's   algorithm-   Prim's Algorithm, applications of graphs

Unit V   Algorithm Design Methods   9 0 0

Greedy   method – Shortest   path – Divide   and   Conquer – Matrix   multiplication-Dynamic programming-Back tracking –Branch and bound-NP Complete Traveling Sales person problem., N Queens Problem

Total : 45 hrs.

Text Book:

1. E. Horowitz, S. Sahani & Mehta, "Fundamentals of Data Structures in C++", Galgotia 2007.

References:

1) Weiss Mark Allen, "Data Structures and Algorithm Analysis in C", Pearson Education, 3/e 2007.
2) E.Horowitz, Sahni & Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications, 2007
3) Jean-Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, 2/e, (2007)
4) Sara Baase & Allen Van Gelder, "Computer Algorithms" Galgotia 2000.

BCS1202	INTRODUCTION TO OOPS WITH C++ AND JAVA	3	0	0	3

Unit I   BASIC CONCEPTS OF OOPS   9 0 0

Programming methodologies -Object Oriented concepts-Definition-Data members-Function members-Access specifiers-Constructors-Default constructors-Copy constructors-Destructors-Static members-Control statements, Basics of C++environment.

Unit II   INHERITANCE AND POLYMORPHISM   9 0 0

Overloading operators-Functions-Friends-Class derivation-Virtual functions-Abstract base classes-Multiple inheritance.

Unit III   TEMPLATES   9 0 0

Class templates-Function templates-Exception handling-Streams.

Unit IV   JAVA PROGRAMMING   9 0 0

Java environment-Classes-Definition-Fields-Methods-Object creation-Constructors-Overloading methods-Static members-This keyword-Nested classes-Extending classes

Unit V   INHERITANCE AND EXCEPTION IN JAVA   9 0 0

Inheritance-member accessibility-Overriding methods-Abstract classes-Interfaces. Exceptions And Threads: Exception and errors -Exception classes - Runtime Exception - Uncompact Exception - Finally block – User defined Exceptions. Creating Threads -Controlling Threads

Total : 45Hrs

Text Books:

1. Stanley B.Lippman, "The C++ Primer" Addison Wesley, 5/e, 2012.
2. H.Schildt , Java 2:The Complete Reference,6/e, Tata Mc Graw Hill-2008

References:

1. Deitel and Deitel, "C++ How to Program" Prentice Hall, 8/e, 2011
2. Programming in java –E.Balagurusamy-Tata Mc Graw Hill,4/e, 2009
3. Ken Arnold and James Gosling, "The Java Programming Language", Pearson Education, 3/e , Reprint 2009.
4. B.Stroustrup,"The C++ Programming Language", 3/e, Pearson Education, 2004.
5. E.Balagurusamy "Object Oriented Programming with C++"- 4/e. "Tata Mcgraw Hill", 2008.

BMA3007	DISCRETE MATHEMATICS	3	1	0	4

UNIT I   LOGIC   (12 hrs)
Statements – Truth Table – Connectives – Normal Forms – Predicate Calculus – Inference
Theory.

UNIT II   COMBINATORICS   (12 hrs)
Mathematical Induction – Pigeon Hole Principle – Principle of Inclusion and Exclusion –
Recurrence Relations – Generating Functions.

UNIT III   GROUPS   (12 hrs)
Basic Concepts – Groups – Subgroups – Homomorphism – Kernel – Cosets – Lagrange's
theorem (simple theorems and problems).

UNIT IV   LATTICES   (12 hrs)
Partial ordering – Posets – Hasse Diagram – Lattices – Properties of lattices – Sub lattices –
Special lattices – Boolean Algebra (Definition and Simple Problems).

UNIT V   GRAPHS   (12 hrs)
Introduction to Graphs – Terminology – Matrix representation of Graphs: Incidence matrix,
Adjacency matrix – Graph Isomorphism – Connectivity – Euler and Hamiltonian Paths (simple
theorems and problems).

Total no. of hrs: 60

Text Books:

1. Veerarajan T., *Discrete Mathematics*, Tata McGraw Hill Publishing Co., (2006).
2. Tremblay J.P., Manohar R., *Discrete Mathematical structures with applications to Computer science*, Tata McGraw Hill Publishing Co., (2004).

References:

1. Kolman, Busby, Ross, *Discrete Mathematical Structures (6th ed.)*, Pearson, (2008).
2. Kenneth Rosen, *Discrete Mathematics and its applications (SIE)*, Tata McGraw Hill Publishing Co., (2007).

BCS1203	COMPUTER GRAPHICS & MULTIMEDIA	3	1	0	4

Unit I   Basics   9 3 0

Overview of graphics system-Video display devices-Raster scan system-Random scan system-Graphics monitor and workstation –Input devices-Hard copied devices-Graphic software.

Unit II   Output Primitives   9 3 0

Output primitives-Line drawing algorithms-Loading the frame buffer-Line function-Circle generation -Ellipse generation curves-Filled area primitives .Attributes of output primitives-Line attributes-Curve attributes-Color and gray scale levels-Area fill attributes-Character attributes-Bundled attributes-Inquiry functions-Antialaising.

Unit III   Two Dimensional Transformation & Viewing   9 3 0

Two dimensional transformation:-Basic transformation-Matrix representations-Composite transformations-Other transformations-Affine transformation-Raster method for transformation Viewing pipeline-Coordinate reference frame-Window to view port transformation-Two dimensional viewing functions-Clipping operations-Point clipping-Line clipping:Cohen-Sutherland line Clipping, Liang-Barsky line Clipping-Polygon clipping: Sutherland-Hodgeman – Curve Clipping-Text Clipping-Exterior Clipping.

Unit 1V   Three Dimensional Concepts and transformation   9 3 0

Three dimensional concepts- Three dimensional concepts- Three Dimensional Transformation, Visible Surface Detection Methods:Back Face Detection,Depth Buffer Method,Scan Line Method.

Unit V   Multimedia System   9 3 0

Introduction - Multimedia applications-Multimedia system architecture-Objects for multimediasystems. Compression and decompression-Types of compression-Binary image compression schemes - JPEG/MPEG.

Total : 60 Hrs.

Text Books:
1. "Computer graphics with Open GL", Donald D.Hearn, M.Pauline Baker and Warren Carithers, 4/e, 2010.
2. Koegel Buford JFK, Multimedia Systems, , ACM Press, 1994, Digitised 2007.

BEC12x1	ELECTRICAL AND ELECTRONIC DEVICES	3	1	0	4

Unit I   DC Circuits   10 3 0

Introduction - v-i relationships of circuit parameters – Voltage source and current source - Kirchhoff's laws – Network reduction techniques – Mesh and Node analysis – Superposition theorem – Thevenin's theorem – Norton's Theorem – Maximum power transfer theorem.

Unit II   AC Circuits   9 3 0

RMS and average values of periodic waves – form factor – phase and phase difference – RL, RC, RLC circuits – Parallel circuits – power and power factor – Introduction to three phase system – solution of balanced three phase circuits – power measurement of 3-phase system.

Unit III   Semiconductor devices   6 3 0

Semiconductor-Materials-PN-Junction   diode-BJT-FET-VI   Characteristics-Rectifiers-Zenerdiode-Voltage regulators

Unit IV   Amplifiers AND Oscillators   10 3 0

Transistor biasing- CE, CB and CC. Amplifiers, Current gain, voltage gain-frequency response-power amplifiers- Feedback Amplifiers - -Oscillators-RC Phaseshift-Wein Bridge-Hartley-Collpit's – analysis

Unit V Analog and Digital Circuits   10 3 0

Operational amplifier Ideal characteristics-Applications-Current to voltage, Voltage to current converters, Arithmeticcircuit-Adder, Subtractor, Multiplier, Differentiator and Integrator. Inverting and Non-inverting amplifiers-Buffer - 555 Timer-Block diagram-Multivibrators

Total : 60Hrs (35 hrs Electronics +25 hrs Electrical)

Text Books:

1. Floyd, "Electronic Device"-Pearson Education–7/e, 2005
2. David A. Bell " Fundamentals of Electronic Devices and Circuits,5/e, Oxford University Press, 2009
3. Sudhakar & Shyammohan , "Circuits & Networks Analysis & Synthesis" Tata McGraw – Hill, 2010. (for Unit 1 &2)

References:

1.Milman and Halkias "Integrated Electronic", TataMcgraw hill publication 2010
2.Boyle stad Nashelsky, "Electronic Devices and Circuit theory", PHI, 10/e, 2009
3.J.A.Edminister, "Theory And Problems On Electric Circuits" Pearson Education Publications,2011

BEC12x2	DIGITAL ELECTRONICS	3	0	0	3

Unit I   NUMBER SYSTEMS   9 0 0

Review of Binary, Octal And Hexadecimal Number Systems – Conversions; Binary Arithmetic – Signed Magnitude form – 1's, 2's   Complement Representation. Codes: - BCD, Excess-3, Grey Codes, ASCII Codes, Error Detecting Codes (hamming code)-Applications of Error Detecting Codes.

Unit II   BOOLEAN ALGEBRA   9 0 0

Boolean Algebra – De Morgan's Law - Simplifications of Boolean Expression – Sum of Products and Product of Sums – Karnaugh Map(upto 5 variables) – Quince McClusky Method of Simplification (Including Don't care conditions)

Unit III   COMBINATIONAL LOGIC   9 0 0

Logic gates – AND, OR, NOT, NOR, NAND and EX-OR – Combinational Logic- Arithmetic Circuits – Half adder – Full adder, Half Subtractor - Decimal Adder – Excess 3 Adder – Code Converters – Multiplexer – Demultiplexer- Encoder – Decoder – Design of General Combinational Logic Circuit. PAL, PLA and FPGA.

Unit IV   SEQUENTIAL LOGIC DESIGN   9 0 0

Building Blocks Of Sequential Logic-Rs, Jk, Master-Slave, D And T Flip-Flop, Asynchronous And Synchronous Counters - Binary And Bcd Counters - Shift Registers –Basic Models Of Sequential Machines – Concept Of State Diagram - State Table – State Reduction - Design And Implementation Of Synchronous Sequential Circuits

Unit V   LOGIC FAMILIES   9 0 0

Characteristics Of RTL, DTL, TTL, Families – Schottky, Clamped TTL, ECL, IIL –   Mos Inverters – Complementary Mos Inverters.IC Based Full Adder ,IC Based Magnitude Comparator.

Total : 45 Hrs.

Text Books:
1. Charles H. Roth, "Fundamentals of Logic Design", 6/e Cengage learning 2010
2. Digital Logic:Application & Design, A.P.Godse, 1/e , 2008, Technical Publication

References:
1. FLOYD:" Digital Fundamentals",8/e edition, 2005, Pearson Education Publication
2. Volnei A. Pedroni "Digital Electronics and Design", 2008, Elsevier Inc.
3. ALBERT PAUL, MALVINO AND DONALD P LEACH: "Digital Principles and Applications" 5/e Glencoe Publications, 2009(digitized)

BCS221	BCSL1201	DATA STRUCTURE USING C++	0	0	3	1

1. Implementation of Stack using arrays and pointers

2. Implementation of Queue using arrays and pointers

3. Implementation of Circular Queue (Using Arrays)

4. Single Linked List

5. Circular Linked List

6. Doubly Linked List

7. Evaluation of Expressions (Infix to postfix conversion & Evaluation of postfix expression)

8. Binary Tree Implementations And Traversals

9. Binary Search Trees

10. Quick Sort , Heap Sort and Merge sort

11. Bubble Sort & Radix Sort.

12. Merge & Selection Sort

13. Linear and Binary Search

14. Implementation of Breadth First Search and Depth First Search

15. Implementation of Graph traversals (BFS and DFS)

BCSL1202	JAVA LAB	0	0	3	1

1. Basic Constructs – Input , output, Display default value of all primitive data types, use of operators, Control Statements – Write 3 programs for using these.
2. Array operations.
3. Concept of Generic class, Inheritance, Interface and Package
4. To demonstrate static variables, methods, and blocks
5. Reuse Class,Multiple inheritance in Java
6. To create a file and write data into it using the methods Output Stream class.
7. The concept of nested for loops and recursion
8. Exception Handling
9. Applets
10. To accept specified number of characters as input and converts them into uppercase characters
11. Creation of threads using runnable class.
12. To check whether the given array size is negative or not.
13. File Handling using Reader and Writer file.
14. Application Programs using JAVA
    a. simulate traffic lights
    b. calculator using GridbagLayout.
    c. Creates the Frame and implements MouseListener

BECL12x1	**DIGITAL ELECTRONICS LAB**	0	0	3	1

1. Verification of Truth tables of Logic Gates

2. Characteristics of digital Logic families

3. Implementation of Boolean function

4. Adders / Subtractors

5. Multiplexers / Demultiplexers

6. Encoder / Decoders

7. Implementation of any general combinational logic circuit

8. Study of Flip – Flops

9. Study of Registers

10. Study of Counters

11. Implementation of any general sequential logic circuits

12. A to D Converters

BCS1204	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

Unit I Fundamnetals of Database   **9 0 0**

Introduction: Purpose of database systems – Data Abstraction -data models – Instances and schemas – Data Independence – DDL – DML – Database user – ER model – Entity sets- keys – ER diagram – relational model – structure – relational algebra- relational calculus- views.

Unit II SQL   **9 0 0**

SQL - QBE - level – Basic Structure – various operations – relational database design – problems in the relational data base design – normalization – normalization using functional – Multivalued join dependence

Unit III File Structure, Indexing & Hashing   **9 0 0**

File and system structure – overall system structure – file transaction – data dictionary – indexing and hashing basic concepts and B+ tree Indices - static and dynamic hash functions

Unit IV System Implementation Techniques   **9 0 0**

Recovery and atomicity-Failures Classification and types – Transaction model and Log based recovery. Schedules-Serial and Non Serial types-Serialization of schedules and views-locks based protocols –time based protocols, Validation techniques.

Unit V Distributed Databases   **9 0 0**

Distributed databases-Structures of distributed data bases –Tradeoffs in distributed the database – design of distributed the database –design of distributed database-Transparency and autonomy- distributed query proceeding-Recovery in distributed system –commit protocols – security and integrity violations –authorization and views security specifications –Encryption- Statistical databases.

                                                            Total: 45 Hrs.

Text Book:
1. Abraham Silberschatz, Henry F.Korth, S.Sudharshan "Database System Concepts", 6/e, Tata McGraw Hill,New Delhi 2010.

References:
1. Ramez Elmasri, Shamkant B.Navathe, "Fundamentals of database systems", 5/e, Pearson Education-2008.
2. C.J.Date,"An Introduction to Database Systems", 8/e AU, Pearson Education 2012.

BCS1205	SOFTWARE ENGINEERING	3	1	0	4

Unit I IMPORTANCE OF SOFTWARE ENGINEERING   **9 3 0**

Introduction - Computer Based System Engineering – Emergent System Properties – Systems and their environment – System modeling – The system engineering process – System procurement **- Software Process** – Software Process Models – Process iteration – Software specification – Software design and implementation – Software validation – Software evolution – Automated process support **– Project Management –** Management activities - Project planning – Project scheduling – Risk Management.

Unit II SOFTWARE REQUIREMENTS   **9 3 0**

– Functional and non-functional requirements – User requirements – System requirements – The software requirements document – **Requirements engineering Processes –**Feasibility studies – Requirements elicitation and analysis – Requirements validation – Requirements management – **System Models –** Context models – Behavioral models – Data models – Object Models – CASE Workbenches – **Software Prototyping** Prototyping in the software process – Rapid prototyping technique – User Interface Prototyping

Unit III   SOFTWARE DESIGN   **9 3 0**

Architectural Design – System structuring – Control models – Modular decomposition – domain Specific architectures **–** Distributed systems architectures – Multiprocessor architectures – Client-Server Architectures – Distributed object architectures – CORBA-**Object-Oriented Design –** Objects and object classes – Design Evolution – **Real-time Software design –** System design, Real-time executives – Monitoring and control systems – Data acquisition systems **– Design with reuse –** Component-based development – Application families – Design patterns – **User Interface Design** – Principles – User Interaction – Information Presentation – User Support – Interface Evaluation

Unit IV   SOFTWARE QUALITY   **9 3 0**

Quality management - Quality assurance and standards- Quality planning-Quality control-Software measurement and metrics- Process measurement-The SEI Process Capability Maturity Model-Process classification. Dependability – Critical systems – Availability and Reliability – Safety – Security.

Unit V SOFTWARE DEVELOPMENT AND TESTING   **9 3 0**

Verification and Validation   – Planning – Software inspections – Automated static analysis – Clean room Software Development – **Software Testing –** Defect Testing – Integration Testing – Object Oriented Testing – Testing Work benches .

                                        Total : 60 Hrs.

Text Book:
  1. Ian Sommerville, "Software Engineering", 8/e, Pearson Education Asia, 2008.

References:
  1. Roger S. Pressman, "Software Engineering: A Practitioner Approach", 7/e McGraw hill Publications 2010,2011(digitized).
  2. Fairley, "Software Engineering Concepts", McGraw-Hill, 2001.

BCS1206	OPERATING SYSTEM	3	0	0	3

Unit I   OS Concepts   9 0 0

Mainframe systems - Desktop systems - Multiprocessor systems - Distributed systems - Cluster Systems - Real time systems-Hardware Protection-System Components-Handheld Systems-Operating System Services-System Calls-System Programs-System Structure-Virtual Machines-System Design and Implementation.

Unit II   Process Management   9 0 0

Process concept-Process Scheduling-Operation on Process-Cooperating Processes- Inter Process Communication-Threads-Overview-Multithreading Models. CPU Scheduling-Basic Concepts-Scheduling Criteria-Scheduling Algorithms-Multiple-Processor Scheduling-Real Time Scheduling-Algorithm Evaluation

Unit III   Synchronization And Deadlocks   9 0 0

Process Synchronization-The Critical Section Problem-Synchronization Hardware-Semaphores-Classical Problems Of Synchronization-Deadlocks-System Model-Deadlock Characterization-Methods of Handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery form Deadlock.

Unit IV   Memory Management   9 0 0

Background-Swapping-Contiguous Memory Allocation -   Address Translation - Paging - Segmentation - Segmentation with Paging. - Static Paging Algorithm -Dynamic Paging Algorithm - Virtual Memory management

Unit V   File and I/O Management   9 0 0

Files And Secondary Storage Management: File Systems - File Concepts - Access Methods - Directory Structure - File System Mounting - File Sharing - Protection - File System Structure - File System Implementation - Recovery - Disk Structure - Disk Scheduling - Disk Management

Total : 45 Hrs.

Text Book:

1. Silberschatz, Galvin, GAGNE "Operating System Concepts" 8/e, John Wiley 2009.

References:

1. D.M.Dhamdhere, "Operating Systems", Tata McGraw Hill, 2/e, 2008.
2. Charles Crowley, "Operating Systems: A Design Oriented Approach", Tata McGraw Hill 2005.
3. William Stallings, "Operating Systems", 6/e, Prentice Hall of India, 2008.

BMA3012	PROBABILITY & LINEAR PROGRAMMING	3	1	0	4

UNIT I   PROBABILITY AND RANDOM VARIABLE   (12 hrs)

Axioms of Probability – Conditional probability – Total probability – Baye's Theorem – Random variable – Probability mass function – Probability density function – Properties – Moments (Definition and simple problems).

UNIT II   STANDARD DISTRIBUTIONS   (12 hrs)

Binomial – Poisson – Geometric –Uniform – Exponential –Normal distributions.

UNIT III   TESTING Of HYPOTHESIS   (12 hrs)

Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F, Chi-square Tests: Independence of Attributes, Goodness of Fit.

UNIT IV   LINEAR PROGRAMMING   (12 hrs)

Formulation of Linear Programming Problem – Standard form of LPP- Graphical Method - Simplex Method – Big M Method – Two Phase method.

UNIT V   Transportaion and Assignment   (12 hrs)

Formulation of Transportation Problem – North West Corner Method – Least Cost Method – Vogel's approximation method – Optimality test – MODI Method – Degeneracy – Assignment problem – Hungarian Method – Travelling Salesman Problem

Total no. of hrs: 60

Text Books:

1. Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2008).
2. Gupta S.C., Kapoor V.K., *Fundamentals of Mathematical Statistics*, S.Chand & Co., (2003).

References:

1. Singaravelu, *Probability and Random Processes*, Meenakshi Agency, (2008).
2. Hamdy A. Taha, *Operations Research: An Introduction (9th ed.)*, Pearson, (2010).
3. Panneerselvam R, Operations Research , 2/e, PHI, 2011

BEC12x3	COMMUNICATION SYSTEMS	3	0	0	3

Unit I   SIGNALS & NOISE   9 0 0

Periodic & Aperiodic Signals – Noise - External Noise – Thermal Agitation – Shot Noise – Noise Figure – Signal to Noise Ratio – Equivalent Noise Resistance

Unit II   INTRODUCTION TO COMMUNICATION   9 0 0

Basic Communication Systems – Need for Modulation in Communication Systems – Amplitude Modulation – Double Side Band Amplitude Modulation – Single Side Band and VSB Modulation – Modulators. Noise in Linear Modulators Noise in Linear Modulation Systems. FM Modulation.

Unit III   DETECTORS, TRANSMITTER AND RECEIVER   9 0 0

AM Demodulators – FM Detectors, AM Transmitter. FM Transmitter – SSB Transmitters, Broadband Transmitter and Receiver AM & FM Receivers, Communication Receivers,Integrated Circuit Based AM & FM Transmitter:& Receiver.

Unit IV   MODULATION TECHNIQUES AND PULSE MODULATION   9 0 0

Phase Modulation – Noise Triangle – Pre-Emphasis and De-Emphasis – Stereophonic FM Multiplex System – Comparison of WideBand and Narrow Band FM – AFC, Introduction – Sampling Theorem –Quantization, Quantization Error, PAM, PTM, PM, PCM – Telegraph..

Unit V   DIGITAL MODULATION & INFORMATION THEORY   9 0 0

Introduction to Digital Modulation System, ASK, FSK, PSK, Transmitter and Receiver,Introduction-Information & Entropy,Source Coding Theory,Data Compaction,Discrete Memoryless Channel,Mutual Information Channel Capacity,Channel Coding Theory.

Total : 45 Hrs.

Text Books:

1. Roy Blake, "Electronic Communication systems", Thomson Learning 2/e , 2002.[no latest edition]
2. Wayne Tomasi," Electronic communications systems: fundamentals through advanced" 5/e Pearson/Printice Hall, 2004
3. Simon Haykins, "principles of Communications", 3/e 2008, Wiley India Publications

References:

1. Taub & Schilling, "Principles of Communication", Tata McGraw Hill Publications,3/e, 2008.

BEC12x4	MICROPROCESSOR AND MICRO CONTROLLERS	3	0	0	3

Unit I   INTEL 16 Bit Microprocessors   **9 0 0**

Register organization of 8086, architecture, Min and Max Mode, Addresing Modes,physical memory organization. InstructionSet, I/O addressing Capability, special processor activities, Introduction to stack, stack structure of 8086, Interrupt and Interrupt service routines, Interrupt cycle of 8086, Assembly level Programming

Unit II Basic peripherals and their interfacing with 8086   **9 0 0**

Interfacing I/O ports, programmable Peripheral interface,8255, Modes of operation of 8255, Programmable Interval Timer (8253), Programmable Interrupt controller (8259), 8237 DMA Controller, USART -825, Applications of 8085

Unit III Microcontroller   **9 0 0**

8051 Microcontroller hardware –I/O pins, ports and circuits, External memory –Counters and Timers,Serial Data I/O –interrupts,

Unit IV Applications   **9 0 0**

8051 Instruction set – Addressing Modes –Assembly Language Programming -8051 interfacing Lcd, ADC, Sensors ,Stepper motors ,Motors, Traffic light controls , Keyboard and DAC

UNIT V 32 bit Microprocessors   **9 0 0**

Architecture of 80386, , addressing modes, Data types of 80386, Real address mode of 80386, protected mode of 80386, Segmentation, Paging, Salient features of PENTIUM, Intel MMX Architecture, MMX data types.

Total : 45 Hrs.

Text Books:
1. A.K.RAY, K.M.BHURCHANDI, Advanced Microprocessors Peripherals, A architecture, Programming and Interface Tata McGraw Hill, eleventh reprint 2011
2. Douglas Hall,S S S P Rao "MICROPROCESSOR AND INTERFACING" Tata McGraw Hill 3/e, 2012

References:
1.Ramesh S Gaoankar, microprocessor Architecture , programming and application with 8085, 4/e, penram international publishing , New Delhi ,2000
2.Mohammed ali Mazidi and Janice Gillispie Mazidi, the 8051 Microcontroller and embedded systems, Pearson education Asia ,New Delhi,2003.

BCSL1203	DBMS LAB	0	0	3	1

I Program to learn DDL and DML commands

      1. Creating a database, simple queries

      2. Use of select statements for queries

              A. AND, OR, NOT operations

              B. Union intersection and join operations

      3. Sorting and grouping

      4. Nested queries using SQL

      5. Built in functions in SQL

      6. Update operations using SQL.

      7. Use of index, creating views and querying in views

II Program to learn PL/SQL

      a. To create a cursor and work on that.

      b. To create PL/SQL code for Exception.

      c. To create PL/SQL code using control statement.

      d. To create PL/SQL code using sub programs.

III Visual Basic

    Program to develop an application for

      a. Pay-roll processing

      b. Student evaluation system.

      c. Computerized quiz

      d. Income tax calculation

      e. Election processing system.

BCSL1204	**OPERATING SYSTEMS LAB**	**0**	**0**	**3**	**1**

1. Basic UNIX Commands
2. Shell Programming (such as database accessing)
        Shell program 1
        Shell program 2
        Shell program 3
        Shell program 4
        Shell program 5
3. System Calls - Fork, Exec
4. Implementation of Scheduling Algorithms
5. IPC Using Message Queues, Pipes and Signals
6. Shared Memory and Semaphores
7. File Allocation Strategies - Best Fit & Worst Fit
8. Dining Philosopher's Problem
9. Bankers Algorithm
10. Page Replacement Strategies
11. Paging & Segmentation
12. File Systems

Resources Required:

        Unix/LINUX,

        Telnet

        C Compiler

BECL12x2	MICROPROCESSOR AND PERIPHERAL INTERFACING LAB	0	0	3	1

8085 Microprocessor: -

1. Assembly language Programming for single byte, multibyte, addition and subtraction, multiplication and division

8086 Microprocessor

2. Searching and sorting

3. Square and square root

4. Block Movement of Data

Interfacing: -

5. Wave form generation using 8255 PPI

6. Keyboard Interfacing

7. Matrix display

Micro Controller Applications:

8. Traffic light controller

9. Stepper Motor Controller

PERIHERALS LAB

10. Seven segment LED Display Routine.

11. Printer Interface.

12. Serial data transfer using COM port.

13. Data Acquisition System.

14. Floppy Disk Drive, Hard Disk Drive Mechanism

BCS1207	SYSTEM SOFTWARE	3	0	0	3

Unit I   CPU Syatem concepts   9 0 0

Basic concepts-Machine structure- Instruction formats – Addressing modes –Typical Architectures.

Unit II   Assemblers   9 0 0

Functions – features – Machine dependent – Machine independent, Design options –OnePass – Multipass – Implementation – Examples.

Unit III   Loaders and Linkers   9 0 0

Functions – Features – Relocation – Program Linking – Linking Loader Implementation Automatic library search – Loader option – Linkage editors – Dynamic linking –Bootstrap loaders – Examples.

Unit IV   Macroprocessors   9 0 0

Functions – Macro parameters – Using labels – conditional macro expansion – Recursive Macro expansion – General purpose macro processors – Examples.

Unit V   Compilers and Utilities   9 0 0

Introduction to Compilers – Different phases of a compiler – Simple One pass Compiler, Code optimization techniques, System software tools, Implementation of editors – Debuggers.

Total : 45 Hrs.

Text Book:

1. L. Beck. "System Software, An Introduction to System Programming", Pearson,3/e,   2008.

References:

1. John R. Levine, "Linkers & Loaders", Morgan Kauffman, 2003.
2. A.V. Aho, Ravi Sethi ,Monica.s, J.D. Ullman. "Compilers Principles, Techniques and Tools", Addison Wesley ,2/e, 2007.

BCS1208	**COMPUTER ARCHITECTURE**	**3**	**0**	**0**	**3**

Unit I   Generic CPU features   9 0 0

Basic structure of Computer Hardware-Von-Neumann Architecture-Functional units – Bus Structures - Instruction formats and types-Addressing modes. RISC Vs CISC

Unit II   Arithmetic and Logic Unit   9 0 0

Fixed point arithmetic operation-addition, subtraction, multiplication, division Floating point arithmetic operation-Design of ALU.

Unit III   Processor Unit   9 0 0

Data path implementation-Control unit-hardwired control, micro programmed control, nano programming- Concepts of pipelining. Pipeline hazards

Unit IV   Memory System   9 0 0

Memory hierarchy-Internal organization of RAM, ROM, Interleaved memory-Cache and associative memories-Virtual memory. Memory organization and cache coherence issues

Unit V   Input/Output and Peripherals   9 0 0

Accessing I/O devices – Programmed Input/Output -Interrupts – Direct Memory Access – IO Processor - Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB), I/O devices.

                                                                                    Total : 45 Hrs.

Text Book:

1. Hayes,” Computer Architecture and Organization”,Tata McGraw Hill,2004, Digitised 2007.

References:

1. Carl Hamacher V., Zvonko G.Vranesic, Safwat G. Zaky, "Computer organization", Tata McGraw Hill, 5/e, 2002 & 2009(digitized).
2. Morris Mano,”Computer System Architecture”, Pearson Education, 3/e, 2007.

BMA3018	NUMERICAL METHODS & OPTIMISATION TECHNIQUES	3	1	0	4

UNIT I   SOLUTION OF EQUATIONS   (12 hrs)

Solution of Algebraic and Transcendental equations – Method of false position – Iteration method – Newton-Raphson method – Solution of Linear system of equations – Gauss Elimination method – Gauss-Jordan method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method – Matrix Inversion by Gauss-Jordan method.

UNIT II   INTERPOLATION   (12 hrs)

Newton forward and backward differences – Central differences – Stirling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT III   NUMERICAL DIFFERENTIATION AND INTEGRATION   (12 Hrs)

Numerical differentiation with interpolation polynomials – Numerical integration by Trapezoidal and Simpson's (both $1/3^{rd}$ & $3/8^{th}$) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

UNIT IV   INVENTORY   (12 hrs)

Elementary concepts – Static EOQ models: Classic EOQ model – EOQ with price breaks – Dynamic EOQ models: No setup model – Setup model.

UNIT V   QUEUING   (12 hrs)

Elementary concepts – Pure Birth and Death process – Single server Markovian models with infinite and finite capacity – Multi server Markovian models with infinite and finite capacity.

Total no. of hrs: 60

Text Books:

1. Veerarajan T., *Numerical Methods*, Tata McGraw Hill Publishing Co., (2005).
2. Sastry S.S., *Introductory Methods of Numerical Analysis*, Prentice Hall of India, (2003).

Reference Books:

1. Hamdy A. Taha, *Operations Research: An Introduction (9th ed.)*, Pearson, (2010).
2. Hillier, Lieberman, *Introduction to Operations Research (8th ed.) (IAE)*, Tata McGraw Hill Publishing Co., (2005).
3. Panneerselvam R, Operations Research , 2/e, PHI, 2011

BCS1210	OBJECT ORIENTED SYSTEM ANALYSIS AND DESIGN	3	0	0	3

Unit I OO COncepts   **9 0 0**

Object Orientation – System Development – Review of Objects- Inheritance – Object Relationship-Dynamic Binding –OOSD Life Cycle - Process – Analysis – Design – Prototyping – implementation – Testing – Overview of methodologies.

Unit II Methodology and Modeling   **9 0 0**

OMT – Booch Methodology – Jacobson methodology – patterns – unified approach -UML –Use case – Class diagrams –Dynamic modeling.

Unit III Object Oriented Analysis   **9 0 0**

Use case model – Creation of Classes – Noun Phrase Approach – Responsibilities –Collaborators – Object Relationships – super Sub classes – Aggregation

Unit IV Object Oriented Design   **9 0 0**

OO Design Axioms – Class Visibility – refining Attributes – Methods – Access layer – OODBMS – Table – Class Mapping view layer

Unit V   Testing   **9 0 0**

Quality Assurance testing – inheritance & testing – test plan – usability testing –User satisfaction - testing.

Total : 45 Hrs.

Text Book:

1. Ali Bahrami,"Object Oriented System Development ", McGraw Hill international, 2008.

References:

1. Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, 3/e., Pearson, 2005
2. Grady Booch, "Object oriented Analysis & design" ,Pearson Education India, 2009.
3. Rambaugh j , blaha M premeriani, W., Eddy F and Loresen W., "object oriented Modeling & design", PHI ,1997.
4. Joey F. George, Dinesh Batra Joseph, S. Valacich ,Jeffrey A. Hoffer, OOSAD -2/e, Pearson, 2006

BCS1211	**ARTIFICIAL INTELLIGENCE**	**3**	**1**	**0**	**4**

Unit I   Introduction and Problem Solving   9 3 0

Introduction– Intelligent agent – Types of agents – Agent Structure – Problem solving agents – Problem Formulation - Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search – Depth limited search – Bidirectional search – Searching with partial Information.

Unit II   Informed Search and Game Playing   9 3 0

Informed search Strategies – A* Heuristic function – Hill Climbing – Simulated Annealing – Constraint Specification problem - Optimal decisions in games – Pruning - Imperfect decisions –Alpha-Beta pruning

Unit III   Knowledge and Reasoning   9 3 0

Knowledge based agent – The Wumpus world environment – First-order logic – Syntax and semantics – Inferences in FOL - Ontology – Forward and backward chaining – Resolution.

Unit IV   Structured Knowledge Representation and Planning   9 3 0

Structured Knowledge Representation- Semantic nets- slots- Frames- Conceptual dependency-Scripts- Planning**-**the planning problem-planning with state space search-partial order planning-planning and acting –simple re-planning agent-fully integrated planning and execution

Unit V   Uncertain Knowledge Reasoning and Learning   9 3 0

Non-monotonic reasoning- Probabilistic reasoning- Use of certainity factors- Fuzzy logic-Concept of Learning- Learning automation- Neural networks- Genetic Algorithms.

                                                                                        Total : 60 Hrs.

Text Books:

   1. Stuart Russel, Peter Norvig,"Artificial Intelligence A modern Approach", Prentice Hall, 2010.
   2. Elaine Rich, Kevin Knight, " Artifical Intelligence", Tata McGraw Hill, 2008.

References:

   1. Artificial Intelligence, A System Approach(Computer Science) By M . Tim Jones 2008.
   2. Ben Coppin," Artificial intelligence illuminated", Jones and Bartlett Learning, 2004.

BCS1212	COMPUTER NETWORKS	3	0	0	3

Unit I   Introduction   9 0 0

The uses of computer networks - Network hardware - Network software - Reference model Example of networks- Network standardization. The physical layer: The theoretical basis for data communication - Guided Transmission media - Wireless transmission - Mobile telephone - Communication satellite.

Unit II   Data Link Layer   9 0 0

Data link layer design issues - Error detection and correction - HDLC –Channel access on links – SDMA – TDMA - FDMA – CDMA -Sliding window protocols – ETHERNET - 802.11, 802.16, Bridges and Switches-Bluetooth.

Unit III   Network layer   9 0 0

Network layer design issues - Circuit switching – Packet switching – Virtual circuit switching-Routing algorithms –Congestion control algorithms - Internetworking- Network layer in Internet -IPV6 .

Unit IV   Transport layer   9 0 0

Transport layer design issues - Transport protocols - Simple transport protocol - Internet transport protocols UDP, TCP - Flow Control – Congestion control - Congestion avoidance.

Unit V   Application layer   9 0 0

Domain name system - Electronic mail - World Wide Web - HTTP - SNMP – Telnet – FTP-RTP.

Total: 45 Hrs.

Text Book:

1. Andrew S. Tanenbaum, "Computer networks ", PHI, 5/e, 2010.

References:

1. William Stallings," Data and computer communications", 8/e, Pearson Education India, 2007
2. Douglas E. comer," Internetworking with TCP/IP-Volume-I", PHI, 5/e, 2006
3. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", 5/e, Morgan Kaufmann Publishers Inc., 2011.
4. Forouzan B. A., "Data Communications and networking", 4/e, TMH, 2007.

BCSL1206	SYSTEM SOFTWARE LAB	0	0	3	1

(USING C)

1. Symbol table and operations.
2. Assembler (Single and Two Pass)
3. Single pass assembler.
4. Macro Processor (Single and Two Pass)
5. Implementation of Absolute loader, Relocating loader.
6. Direct-Linking Loader (Pass one and two)
7. Simple text editor with useful features for text operation
8. Symbol table implementation using hashing.

BCSL1207	**SOFTWARE SYSTEM DEVELOPMENT LAB**	**0**	**0**	**3**	**1**

OBJECTIVE: To develop a mini-project following the exercises listed below.

1. Develop a problem statement.
2. Develop an IEEE standard SRS document.
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Identify the User Interface.
8. Implement the system

EXERCISES

       A. Online Railway reservation system
       B. Student Mark Analysis system
       C. Payroll processing application
       D. Inventory system
       E. Quiz system
       F. Automating the Banking process
       G. Course Registration System
       H. Library management system
       I. Passport Automation System

SOFTWARE REQUIRED:

     Languages: C/C++/JDK 1.3, JSDK, WEB BROWSER & UML
     Any Front End Tools (Like VB, VC++, Developer 2000)
     Any Back End Tools (Like Oracle, MS-Access, SQL, DB2)
     Modelling and Design : Rational Rose

BCSL1208	**NETWORK PROGRAMMING LAB**	**0**	**0**	**3**	**1**

1. Socket program for Echo/Ping/Talk commands.

2. Create a Socket (TCP) between two computers and enable file transfer between them.

3. To implement remote command execution (two m/c's can be used).

4. Create a socket (UDP).

5. Port simulating ARP/RARP.

6. Create a socket for HTTP for web page upload and download.

7. File transfer in Client-Server architecture using following methods

  a) Using RS232C

  b) Using TCP/IP

8. To implement RMI (Remote Method Invocation)

9. Perform a case study about different routing algorithms to select the network path with its optimum and economical during data transfer

  a) Shortest path routing

  b) Flooding

  c) Broadcast /Multicast routing

10. Demonstration of Network Simulators.

BCSA1201	CAREER & CONFIDENCE BUILDING IV SEMESTER	0	1	0	2

OBJECTIVES

To Improve:
1. Behavioural Patterns and Basic Etiquette
2. Value System
3. Inter Personal Skills
4. Behaving in Corporate Culture
5. Self Awareness / Confidence
6. Managing Self and Personality Styles including Body Language
7. International Culture / Cross Cultural Etiquette

Unit I

Creation of awareness of the top companies / different verticals / courses for improving skill set matrix, Industry expectations to enable them to prepare for their career - Development of positive frame of mind - Avoiding inhibitions - Creation of self awareness - Overcoming of inferiority/ superiority complex.

Unit II

Selection of appropriate field vis-a-vis personality / interest to create awareness of existing industries, Preparation of Curriculum Vitae - Objectives, profiles vis-a-vis companies.

Unit III

Group discussions: Do's and Don'ts - handling of Group discussions – What evaluators look for! Interpersonal relationships - with colleagues - clients - understanding one's own behaviour - perception by others, How to work with persons whose background, culture, language / work style different from one's, behaviour pattern in multi-national offices.

Unit IV

Interview - awareness of facing questions - Do's and Don'ts of personal interview / group interview, Enabling students prepare for different procedures / levels to enter into any company - books / websites to help for further preparation, Technical interview - how to prepare to face it, Undergoing employability skills test.

Unit V

Entrepreneurship development - preparation for tests prior to the interview - Qualities and pre-requisites for launching a firm.

30 Hours

BCS1209	MODELLING AND SIMULATION FOR ENGINEERS	3	0	0	3

Unit I   Basics of Modelling and Simulation   **9 0 0**

   From Formula to Program - Just Plug It In - Surface Area of a Sphere- Arithmetic expressions, assignment, input, output -**Check and Evaluate** -Minimum of a Quadratic on an Interval. Boolean expressions, conditionals.   **Limits and Error -** Tiling a Disk Summation, for-loop. Inside/Outside Polygons Sequences, while-loop. **Approximation with Fractions -** Counting, Proximity to P. Nested loops, benchmarking, Fibonacci Quotients and the Golden Ratio.

Unit II   The Discrete versus the Continuous   **9 0 0**

   Plotting continuous Functions- Vectors, elementary graphics, Color Computations. **Abstraction**: Reshaping Rectangles, Ellipse Perimeter, A Square and a Root, Simple functions. Oval Odometer Ellipse Perimeter Functions with multiple input parameters, Design parameters, The Betsy Ross Problem Design Parameters **Randomness -**Safety in Numbers, Monte-Carlo Simulation.

Unit III The Second Dimension   **9 0 0**

   Transition Matrices. Two-dimensional arrays, Contours and Cross Sections-Visualizing F(x,y). Contour plotting-Simulation on a Grid. **Reordering:** The Perfect Shuffle- **Points, Polygons, and Circles:** Distance metrics, Simple structure-Intersection.

Unit IV Searching   **9 0 0**

   Linear Search- Character arrays, Binary Search, Cell arrays, Bisecting for Roots Functions as parameters. **Text File Processing:** Data Acquisition and Conversion, Reading data from a text file. Writing and Representation, Creating .dat and .bin files. **The Matrix:** Linear Interpolation and Color Mapping, row-by-row matrix setup- Bilinear Interpolation and Shading, Image Digitization -Cell arrays of matrices, Working with Image Data Files, imread, imwrite.

Unit V Applications Using Matlab   **9 0 0**

   Acoustic File Processing Acquisition and Playback, wavread, sound, wavwrite, Frequency and Sampling, **Divide and Conquer:** Recursive Tiling, Recursive functions, Merge Sort. **Optimization -** Shortest Route, Constraints and Objective Functions.

Text Book:

1. **Insight Through Computing: A Matlab Introduction to Computational Science and Engineering by C. F. Van Loan and K.-Y. D. Fan. SIAM Publication, 2009, ISBN: 978-0-898716-91-7.**

References:

1. Brian R. Hunt Ronald L. Lipsman Jonathan M. Rosenberg with Kevin R. Coombes, John E. Osborn, and Garrett J. Stuck , **A Guide to MATLAB for Beginners and Experienced Users**, Cambridge University Press, 2001.
2. Andrew Knight Chapman & Hall, Basics Of Matlab and Beyond , CRC Press ,2000.
3. Kermit Sigmon and Timothy A. Davis CHAPMAN & HALL, MATLAB Primer, 6th Edition, CRC Press Company, .2002.

BCS1213	PRINCIPLES OF COMPILER DESIGN	3	0	0	3

Unit I   Compiler Organisation   9 0 0

Compilers-Analysis of source program-Phases of a Compiler- Cousins of Compiler- Grouping of phases-Computer Language Representation—Compiler Construction Tools.

Unit II   Lexical Analysis   9 0 0

The role of the lexical analyzer-Input Buffering-Token Specification-Design of lexical analyzer-Finite Automata-A language for specifying lexical analyzers-Recognition Machine - Error Recovery-Top down Parsing principles.

Unit III   Syntax Analysis   9 0 0

Parsing-Context Free Grammars-Writing a Grammar-Top-down Parsing- Implementation - Bottom-up Parsing - LR Parsers - Parser Generator(YACC).

Unit IV   Intermediate Code Generation   9 0 0

Intermediate Code generation-Intermediate Languages - Declarations - Flow Control Statements - Backpatching- Procedure Calls – Symbol Table.

Unit V   Code Generation   9 0 0

Introduction to Code Generation-Issues in the design of a code generator-Run Time storage management-The Dag representation of basic blocks-introduction of Code Optimization-Run Time Environments.

Total : 45 Hrs.

Text Book:

1. Alfred   V.Aho   Ravi   Sethi,   Jefferey   D.Ullman,Monica   S   Lam   "Compiler Principles,Techniques and Tools",2/e, Pearson Education 2007.

References:

1. Chattopadhyay Santanu, ”Compiler Design” ,PHI 2007.
2. Allen Holub I., "Compiler Design in C", PHI, 2007.
3. V Raghavan , “Principles of compiler”, Tata Mc Graw Hill, 2009
4. Kenneth C Louden, Compiler Construction Principles & Practice,Thompson learning 2003

BCS1214	WEB TECHNOLOGY	3	0	0	3

Unit I   HTML   9 0 0

Introduction – Network concepts – Web concepts – Internet addresses – Retrieving data with URL – HTML –Multimedia components – Frames – Form and its objects – Image maps – DHTML – Cascading / Style sheets.

Unit II   XML Technology   9 0 0

XML – Benefits – Advantages of XML over HTML – XML based standards – Structuring XML document using DTD – Schemas – XML parsers – DOM – SAX presentation technologies – XSL – XFORMS – XHTML –Transformations – XSLT – XLINK – XPATH – Xquery.

Unit III   Client Side Scripting   9 0 0

Java Script – Advantages – Data types – Variables – Operators – Control statements – Functions – Objects and arrays – Windows and frames – Forms.AJAX – XMLHttpRequest (XHR) – Create Object – Request – Response – Ready state. Introduction – jQueryn - E4X.

Unit IV   Server Side Scripting   9 0 0

ASP – Need for ASP – Introduction to ASP objects – Response – Request – Server – Session – File access – Working with ASP components like Ad rotator – Content linking and Rotator – Displaying browser Capabilities and counters – Sending mails – Accessing database – PHP – Introduction Forms – Sending a mail.

Unit V   Web Applications   9 0 0

Web Applications – Security – Database access and mapping – Web template system – Web services – SOA – SOAP – WSDL – UDDI.

                                                                 Total : **45 Hrs**

TEXT BOOK

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, Internet & World Wide Web: How to Program, 5/e, Pearson,2011

References:

2. Heather Williamson, " The Complete Reference XML", Tata McGraw Hill, Eleventh reprint 2008.
3. Thomas A. Powell, " HTML: The Complete Reference", 3/e, Osborne/McGraw Hill, 2001.
4. Thomas Powell ,Fritz Schneider ,"The Complete Reference – Java Script", 2/e, 2004, 8th reprint 2008.
5. Eric Ladd,Jim O'Donnell, "Using HTML 4,XML and Java", QUE, 2001.
6. Leon Shklar, Rich Rosen, "Web Application Architecture: Principles, Protocols, and Practices", 2/e, John Wiley & Sons, 2004.
7. A. Russell Jones, "Masteering Active Server Pages 3", Wiley India Pvt. Limited, 2009.

BCS1215	**ADVANCED JAVA PROGRAMMING**	**3**	**1**	**0**	**4**

Unit I   Java Basics Review   9 0 0

Java Streaming - Components and Events Handling - Threading Concepts –Byte Code Interpretation - Java Native Interfaces,AWT/Swing Programming

Unit II   Advanced Networking and Beans   9 0 0

Networking Features - Client-Server computing – Sockets - secure sockets – custom sockets – UDP datagrams – multicast sockets - URL classes – Reading / Writing Data from the server – writing data -Developing Distributed Applications - RMI - Remote Objects – Object Serialization - Bean Concepts - Events in Bean Box - Bean customization and persistence.

Unit III   Java Database Programming   9 0 0

Connecting to Databases - JDBC principles - Databases access - Database Support in Web applications - Using BLOB and CLOB objects – storing Multimedia data into databases – Multimedia streaming applications – Java Media Framework.

Unit IV   Web Based Java   9 0 0

Server Side Programming – Servlets – Java Server Pages - Struts – MVC framework, Advanced Java Scripting Techniques

Unit V   Enterprise Applications   9 0 0

Server Side Component Architecture – Introduction to J2EE – Session Beans – Entity Beans – Persistent Entity Beans – Transactions- JAR File Format and Creation.

Total : 45 Hrs.

Text Books:

1. JAVA, " Complete Reference" , by Herbert Schildt, 8th Edition,2011 (UNIT I and UNIT II)
2. J2EE, " Complete Reference" , by Herbert Schildt,2007.(UNIT III)
3. McGovern et al,"J2EE 1.4 Bible",Wiley India,,2011 (UNIT IV and UNIT V)

References:

1. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill, 2003.
2. J2EE, " The Complete Reference" , by Keogh,2002
3. Web reference: http://java.sun.com.

BCSL1205	**MODELLING AND SIMULATION LAB**	**0**	**0**	**3**	**1**

1. Use built in functions : drawRect, drawDisk, and drawStar
2. Calculate Perimeter of Ellipse , Surface area of a sphere
3. Draw Different Shapes - Polygons, Circles and rectangles
4. Do Calculations: (i) Average 10 numbers from user input, (ii) Calculate Each Student total for 6 subjects from user input.
5. Sort an array of objects using matlab commands and sort algorithms (Merge Sort and Insertion Sort)
6. Draw a (i) sequence of nested stars (ii) frame on the edge of a grayscale jpeg image
7. Implementation of plot comparison   (i).One point at a time, (ii).using vectors of x and y values
8. Find min of $q(x)=x^2+bx+c$ given b, c and random L,R
9. Simulate a 2D random walk in an (2N+1)-by-(2N+1) grid and animate
10. Implement the conversion of a color image to grayscale image
11. Estimate the average length of the short piece
12. Demonstrate 3 disks fading from yellow to black, White to black
13. Draw 1-by-1 black background squares and animate the movement with random
14. Demonstrate Linear Interpolation and Color Mapping
15. Read data from a text file and print it on screen
16. Implement the recursive function

BCSL1209	**COMPILER DESIGN LAB**	**0**	**0**	**3**	**1**

1. Lexical analyzer in "C".
2. Constructing NFA from a regular expression
3. Constructing DFA from a regular expression
4. To eliminate Left Factoring
5. Constructing top down parsing table.
6. Shift-reduce parsing algorithm.
7. Operator-Precedence parsing algorithm.
8. Constructing LR-Parsing table..
9. Generate a code for a given intermediate code.
10. Generate Machine code.

Software Required: Turbo C

BCSL1210	VALUE ADDED TRAINING PROGRAMME / THREE TIER APPLICATION PROJECT	0	0	2	1

Having acquired the core competency in the Computer science domain over the last 6 semesters, the students are expected to take up an application project for any real life scenario and provide a solution for the same . The implantation is expected to be based on a 3 tier architecture design.

For the award of the 1 credit the students are expected to demonstrate the project. The evaluation for this credit will be carried out in the first week of 7th Semester so that the students can do detailed work utilizing the end semester holidays of 6th semester.

The allotted faculty can provide guidelines and consultation on a weekly basis.

Any Value adding training Program of Industry Standard can be considered in lieu of project for awarding credits

BCSL1211	WEB TECHNOLOGY LAB	0	0	3	1

1. Basic HTML Coding
   a. Create a website using basic HTML Codes
   b. Create a Web page using Cascading Style Sheet

2. Program using JavaScript and DHTML to validate the following in a form.
   a. Email, user profile, user login, registration, age, Date, payment options, Password, mobile number

3. Write a Java Program to get Date and Time from the server using TCP/UDP.

4. Write an XML file which will display information about a Book. The information includes:
   1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price

5. Write a java program to create applets with the following features.
   Create a color palette with matrix of buttons.
   a) Set background and foreground of the control text area by selecting a color from color   palette.
   b) In order to select foreground or background use checkbox controls as radio buttons.
   c) To set background images.

6. Install TOMCAT Web Server and APPACHE
   a. To write java servlet program to conduct online examination and to display student mark list   available in a database.
   b. Publish Examinations Result in web.

7. Write a JSP program to create an online shopping cart. (Online book store)

8. Create a website using the following ASP components
   ASP AdRotator
   ASP BrowserCap
   ASP Content Linking
   ASP Content Rotator

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BCSA1202	QUALITATIVE / QUANTITATIVE SKILLS	0	1	0	2

PURPOSE

The purpose of this course is to build confidence and inculcate various Soft skills and to help Students to identify and achieve their personal potential at the end of this training program the participant will be able to, explain the concept of problem solving

- Outline the basic steps in problem solving
- List out the key elements
- Explain the use of tools and techniques in problem solving
- Discuss the personality types and problem solving techniques.
- By adapting different thinking styles in group and lean environment.
- Recognizing and removing barriers to thinking in challenging situations.
- Make better decision through critical thinking and creative problem solving.

METHODOLOGY

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities + individual activities
2. Collaborative learning
3. Interactive sessions
4. Ensure Participation
5. Empirical Learning

Unit -I

Self Introduction- Narration – Current News Update – Numbers – Height & Distance – Square & Cube Roots.

Unit - II

Current Tech Update – Verbal Aptitude Test 1 – GD – 1 Odd man out series – Permutation & Combination – Problems on ages.

Unit – III

GD –II – Resume Writing – Mock Interview I / reading comprehension

Unit – IV

Mock Interview II / reading comprehension – Mock Interview III / reading comprehension – GD – III – Ratio & Proportion – Clocks – H.C.F. &L.C.M

Unit – V

GD – IV – Verbal Aptitude Test II – Review – Partnership – Puzzels – Test

Total : 30 Hrs.

References:

1. Pushplata and Sanjay Kumar, "Communicate or Collapse: A Handbook of Effective Public Speaking", Group Discussions and Interviews. Prentice – Hall, Delhi, 2007
2. Thorpe, Edgar, "Course in Mental Ability and Quantitative Aptitude", TMHl, 2003.
3. Thorpe, Edgar, " Test of Reasoning ", Tata McGraw-Hill , 2003
4. Prasad, H.M, " How to prepare for Group Discussion and Interview", TMH, 2001
5. "Career Press Editors. 101 Great Resumes", Jaico Publishing House, 2003
6. Agarwal, R. S., A Modern Approach to Verbal and Non- Verbal Reasoning, S. Chand & Co., 2004
7. Mishra Sunita and Muralikrishna, " Communication Skills for Engineers", Pearson , 1/e, 2004

BCS1216	. NET FRAMEWORK	3	0	0	3

Unit I   .NET Framework 9 0 0

.NET platform, .NET Frame work, Common Language Runtime, Namespace, assemblies, .NET memory management Introduction to C#.net, Introduction to VB.NET.

Unit II   C#.NET 9 0 0

Introduction to c#, Understanding C# in .NET, Overview of c#, literals, Variables, Data Types. Operators, Expressions, Branching and Looping Operations- Methods, Arrays Strings. Structures and Enumerations – Classes and Objects- inheritance and Polymorphism,Multiple Inheritance, Operator Overloading, Events, Console I/O Operations and Exception**.**

Unit III   VB.NET 9 0 0

Introduction, Windows application, Web application, Building Blocks, programming Fundamentals, Creation of Windows Forms, SDI Vs MDI, Crating run time WindowsControls. File handling, Interaction with other Applications, Creating and using reports, Debugging and Packaging.

Unit IV   ADO.NET 9 0 0

ADO.NET, Connected Objects, Disconnected Objects, Data Form Wizard, Data Bound Form, Various Connection Methodologies for Database, Querying database, usage of Data Adapter class. Working with data off-line, Data view object, strongly typed Dataset Objects. Working with XML data, Building Windows based and web based application, .Net data providers

Unit V   ASP.NET& Web services 9 0 0

Creation of web services, web service with ASP.NET, ASP.NET applications with databases, cookies and session handling.

Total : 45 Hrs.

Text Books:

1. Kogent Solutions Inc, C# 2008 Programming: Covers .Net 3.5 Black Book, Platinum Ed, Dreamtech Press, 2009
2. E. Balagurusamy , Programming in C#**,** 3/e, Tata McGraw-Hill tenth reprint 2010.

Reference Books:
1. Thuan L.Thai, Hoang Lam, .NET Framework Essentials **,**O'reilly Media Inc, 3/e, 2003.
2. Kip R Irvine Tony Gaddis, Starting Out with Visual Basic 2008 , 4/e, Addison Wesley publication, 2009.
3. Evjen, Hanselman, Rader, Profesional ASP.NET 2.0 , John Wiley & Sons, 2005.
4. David Sceppa ,Programming Microsoft ADO.NET4,on Amazon.com, 2013.
5. web reference http://msdn.microsoft.com/en-us/vstudio/default.aspx

BCS1217	DATA WAREHOUSING AND DATA MINING	3	1	0	4

Unit I   Data Warehousing   9 3 0

Introduction to Data Warehousing- Adavntages- What makes Data Warehousing a reality- Data warehousing Components-Building a Data Warehouse-mapping Data Warehouse to a Multiprocessor-Architecture-DBMS Schemas for Design Support.

Unit II   ETL and Business tools   9 3 0

Data Extraction-Cleaning and Transferring tools- Meta data. Reporting and Query tools and Application-OLAP-Patterns and Models- Statistics.

Unit III   Data Mining   9 3 0

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.- Data Cleaning –Missing Values-Noisy Data-Inconsistent Data-Data Integration and Transformation-Data Reduction -Dimensionality Reduction – Evaluation criteria of Various Mining Techniques

Unit IV   Association Rule Mining And Classification   9 3 0

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Constraint Based Association Mining – Classification and Prediction - Decision Tree Induction   - Entropy and Classification Algorithms -Bayesian Classification – Rule Based Classification.

Unit V   Clustering Techniques   9 3 0

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods - Kmeans – Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis –Genetic Algorithm For Mining - Data Mining Applications.

Total : 60 Hrs.

Text Books:
1. Alex Berson-Stephen. J.Smith, "Data warehousing-Data Mining & OLAP", TMH 2006
2. Jiawei Han and Micheline Kamber , "Data mining concepts and techniques", Morgan Kaufmann Publishers,2011.

References:
1. Arun K Pujari, "Data Mining Techniques", Universities Press (India) Ltd., 2002.
2. Sam Anahory, Dennis Murry," Data Warehousing in the real world", Pearson Eductation 2004
3. Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson, 2006.

BMG12x1	PRINCIPLES OF MANAGEMENT	3	1	0	4

Unit I   Foundations Of Management   9 3 0

    Definition, Principles of Management – Nature, Scope, Functions of Management, Management – Science /Art/Profession. Managers Vs Entrepreneurs – Managers Vs Leaders, Types of Business Organization, Guidelines for Managerial Excellence and Success.

Unit II   Planning   9 3 0

    Management Practice –Steps involved in Planning, Planning Premises, Strategy and Tactics – Implementation - Organizing, Co – ordination, Controlling – Management process, Decision-making.

Unit III   Organizing   9 3 0

    Nature and purpose-Formal and informal organization-Resistance – Standards – Budget – Program – MBO/SWOT – MBE –Organizational Structure and Design – Authority & Responsibility , Relationship – Delegation –Line and Staff authority-Staffing- Selection Process- HRD – Conflicts.

Unit IV   Directing and Controlling   9 3 0

    Nature of Evaluation, Designs of problems – Appraising Techniques – Compensation plans – Direction – Leadership-Types of Leadership Motivation-Hierarchy of needs-Co-Ordination – Quantitative and Qualitative measures of Control – Feedback of Management.–System and process of Controlling - Requirements for effective control - Control of Overall Performance - Direct and Preventive Control – Reporting.

Unit V   Contemporary Management Issues   9 3 0

    The Global Environment - Globalization and Liberalization - International Management and Global theory of Management. Enhanced Technology Management – Social Responsibility – Managing Innovation – Stress Management.

Total: 60Hrs.

Text Books:
1. Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill, 2006.
2. Tripathy PC And Reddy PN, " Principles of Management", Tata McGraw-Hill, 4/e, 2008.

References:
1. Stephen P. Robbins, Fundamentals of Management : Essential Concepts and Applications, Prentice Hall-2012, 8/e .
2. L.M.Prasad, Principles and Practice of Management, Sultan Chand & Sons -2008.
3. Koontz, Principles of Management – McGraw Hill Education, 2004.

BCS1212	. NET LAB	0	0	3	1

C# .NET

1. Implementation of Operator Overloading
    a. Complex Number
    b. Matrix
    c. Time(+.-)
2. Implementation of Multiple Inheritance
    a. Employee
    b. Area of an Object
3. Implementing Multithreading

VB .NET

4 .Designing a Calculator
5. Implement File Handling(Read,Delete,Modify)
6. Implement Exception Handling
    a. Voter problem
    b. Student Status
7. Event Handling – Mouse Click,Button click

ASP .NET

8. Super Market
9. Hotell Management System

ADO. NET

10. Student Attendance Calculation
11. Hospital management System

WEB SERVICE

12. Income tax calculation

BCSL1213	COMPREHENSION / FOREIGN LANGUAGE CERTIFICATION	0	2	0	2

The objective of comprehension is to provide opportunity for the student to apply the knowledge acquired during the academic program to real – life problems which he/she may have to face in future as an engineer.

Therefore the students are to be guided for objective and Technical interview for prospective placement or higher studies. This may be carried out through practice problems based on various subjects. Weekly 2 hours may be allotted for this purpose.

The end semester examination be conducted as objective type for 100 marks , inclusive of core subjects and technologies .

Any Foreign Language Certification obtained on languages like French,German , Japanese etc can also be considered for awarding the 2 credits.

BCSL1214	**PROJECT (PHASE – I)**	**0**	**1**	**3**	**2**

B.Tech CSE Project carries 8 credits of which , Phase I carries 2 credit. In Phase I ,Students are expected to

(i)   Identify a Problem.
(ii)   Have the feasibility explored.
(iii)   Freeze the Requirment specification (both user and system).
(iv)   Construct the architectural model(as many as required).
(v)   Design the solution.

BCSL1215	FREE AND OPEN SOURCE SOFTWARE (FOSS) LAB	0	1	3	1

S.NO	NAME OF THE EXPERIMENT
1.	LINUX INSTALLATION AND BASIC OPERATION
2.	MYSQL INSTALLATION AND BASIC COMMANDS
3.	PHP –DESIGN A WEBPAGE
4.	PHP AND MYSQL CONNECTIVITY
5.	PYTHON PROGRAMMING

1. Getting started with Linux, learn basic Commands and directory structure, execute file and directory operation. (1 session)
2. Learn the basic commands to execute the operation. (2 sessions)
3. MY SQL Installation and basic commands to execute the operation. (2 session)
4. To Create Login Page using PHP for Conference Announced (2 sessions)
5. To create a login form and test the connectivity with MYSQL for a application like registration for a conference organizer. (3 sessions)
6. Get started with Python, learn the basic types and control flow statements.

   Python Programs (4 sessions)

   a. String Concatenation in python programming
   b. Write a python program to perform function in Lists
   c. Write a python program to perform functions in tuples
   d. Write a python program to perform functions in Dictionary.
   e. Write a python Program to select odd number from the lists
   f. Conditional statement in Python
   g. For Statement in Python
   h. Prime Number using Python.

BMG12x2	ENTREPRENEURSHIP DEVELOPMENT	3	1	0	4

UNIT – I

Entrepreneur – Traits and types, Creating and starting the venture – Sources of new ideas,Methods of generating ideas, Product planning and development process and establishing evaluation criteria.

UNIT – II

Business plan – Marketing plan - Marketing research for the new venture, Marketing mix, steps in preparing marketing plan. Financial plan – Proforma of income statements, Cash flow, Balance sheet, Break even Analysis, Application of funds. Organizational plan-legal forms of Business, Tax attributes, Role of Board of Directors, Advisors, Designing the organization. Risk assessment, Sources of finance-equity, Financial Institutions and Commercial banks.

UNIT – III

Record keeping-Meaning, Methods, Types, Hiring-concept, Procedure for hiring, Motivation – Entrepreneurial theories of motivation, Leadership - Styles of leadership.

UNIT – IV

Financial control - Managing cash flow, managing inventory, fixed assets, Managing cost and profits, Taxes. Entrepreneurial skills – Marketing skills, Strategic planning, Time Management skills, Negotiation skills.

UNIT – V

Other routes for success - Joint venture – Meaning, Types, Advantages Acquisition – Meaning, Importance advantages merger - Advantages, Disadvantages franchising – Advantages of franchising entrepreneur's point of view, Types going public – Raising funds
from the market.

Text Book:
1. Robert Hisrich, Michael Peters, Dean Shepherd, Entrepreneurship, Tata McGraw-Hill, 6/e, 2011.

References:
1. Donald F. Kuratko, Richard M. Hodgetts, Entrepreneurship theory, Process and Practice , 8/e, Cengage learning, 2008.
2. Prasana Chandra, Projects-planning, analysis, selection, implementation and reviews,Tata McGraw-Hill, 7/e, 2009.

BCS1218	INFORMATION STORAGE MANAGEMENT	3	0	0	3

Unit I   Storage Systems   9 0 0

Information Storage - Evolution of Storage Technology and Architecture – Data Centre – Infrastructure – ILM – Components of Storage System Environment – Logical Components of Host RAID: Implementation, levels & comparison – ISS components, Intelligent Storage Array.

Unit II   Storage Technologies   9 0 0

Storage Networking Technologies & Virtualization DAS – SCSI – SAN – NAS –IPSAN – CAS – Forms of Virtualization.

Unit III   Business Continuity   9 0 0

Information availability – BC Planning Life Cycle failure analysis – Backup & Recovery – Local Replication – Remote Replication.

Unit IV   Storage Security   9 0 0

Storage Security Framework – Risk Triad – Storage Security Domains – Security Implementation in Storage Networking.

Unit V   Managing Storage Infrastructure   9 0 0

Monitoring the Storage Infrastructure – Storage Management Activities and Challenges – Developing an Ideal solution.

Total : 45 Hrs.

Text Book:

1. EMC Corporation, Information Storage and Management, WileyIndia,2010

References:

1. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill , Osborne, 2003.
2. Marc Farley, "Building Storage Networks", Tata McGraw Hill ,Osborne, 2001.

BCSL1216	**PROJECT (PHASE – II)**	0	0	12	6

Students are expected to carry out the following :

    (i)   Implement the Design using suitable technologies.

    (ii)   Generate the test cases.

    (iii)   Demonstrate the solution with suitable user interface.

    (iv)   Prepare a project report consolidating the phase-I and II activities.

BCSE1211	DATABASE TUNING	3	0	0	3

Unit I   FUNDAMENTALS OF TUNING   8 0 0

Review of Relational Databases – Relational Algebra - Locking and Concurrency Control – Correctness Consideration – Lock Tuning – Logging and the Recovery Subsystem – Principles of Recovery – Tuning the Recovery Subsystem – Operating Systems Considerations – Hardware Tuning.

Unit II   Indexing and Hashing   8 0 0

Types of Queries – Data Structures – B tree – B+ Tree - Hash Structures – Bit Map Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Comparison of Indexing and Hashing Techniques.

Unit III   QUERY OPTIMIZATION   10 0 0

Techniques - Tuning Relational Systems – Normalization – Tuning De-normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers – Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases.

Unit IV   TROUBLESHOOTING   10 0 0

Query Plan Explainers – Performance Monitors – Event Monitors – Finding "Suspicious" Queries – Analyzing a Query's Access Plan – Profiling a Query Execution – DBMS Subsystems.

Unit V   CASE STUDIES   9 0 0

Transaction Chopping – Time Series Databases – Understanding Access Plans – Configuration Parameters: Oracle; SQL Server; DB2UDB – Distributed Database – Implementation.

Total: 45 hrs

Text Books:
1. Dennis Shasha and Philippe Bonnet "Database Tuning, Principles, Experiments, and Troubleshooting Techniques", Elsevier Reprint 2005**.**
2. Thomas Connoly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", 4/e, Pearson Education, 2009
3. M.Tamer Ozsu, Patrick Valduriez and S.Sridhar "Principles of Distributed Database Systems", Springer 2011, 3/e

BCSE1212	ADVANCED KNOWLEDGE MANAGEMENT	3	0	0	3

Unit I   BASICS OF KNOWLEDGE MANAGEMENT   9 0 0

The value of Knowledge – Knowledge Engineering Basics – Knowledge Economy – The Task and Organizational Content – Knowledge Management – Knowledge Management Ontology.

Unit II   KNOWLEDGE MODELS   9 0 0

Knowledge Model Components – Template Knowledge Models –Reflective Knowledge Models– Knowledge Model Construction – Types of Knowledge Models.

Unit III   TECHNIQUES OF KNOWLEDGE MANAGEMENT   9 0 0

Knowledge Elicitation Techniques – Modeling Communication Aspects – Knowledge Management and Organizational Learning.

Unit IV   KNOWLEDGE SYSTEM IMPLEMENTATION   9 0 0

Case Studies – Designing Knowledge Systems – Knowledge Codification – Testing and Deployment – Knowledge Transfer and Knowledge Sharing – Knowledge System Implementation.

Unit V   KNOWLEDGE MANAGEMENT APPLICATIONS   9 0 0

Advanced Knowledge Modeling – Value Networks – Business Models for Knowledge Economy – UML Notations – Project Management.

Total: 45 hrs

Text Books:

1. Guus Schreiber, Hans Akkermans, Anjo Anjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, "Knowledge Engineering and Management", Universities Press, 2003
2. Elias M.Awad & Hassan M. Ghaziri, "Knowledge Management", PHI Learning , 2/e, 2010

References:

1. C.W. Holsapple, "Handbooks on Knowledge Management", International Handbooks on Information Systems, Vol 1 and 2, Springer 2003.
2. Shelda Debowsks ,"Knowledge Management," Wiley 2007
3. http://www.epistemics.co.uk
4. http://depts.washington.edu/pettt/papers/WIN_poster_text.pdf

BCSE1213	INFOMETRICS	3	0	0	3

Unit I   IT ORGANIZATION   9 0 0

Metrics that matter - Interpreting the metrics – Collecting the data – Managing the data – Obstacles to acquiring IT metrics information – Old data versus new graphical analysis – Core of software planning –Measuring the core metrics (Product, Quality, Process, Productivity, Time, Effort) – Estimating and controlling with the core metrics – Work output measurements.

Unit II   MEASUREMENT PROGRAM APPROACHES   9 0 0

EDS Brazil metrics program – Measurement program implementation approaches – Bench marking – Data definition framework for defining software measurements.

Unit III   SOFTWARE METRICS   9 0 0

Functional points as part of measurement program – Estimation of software reliability – Establishing central support for software sizing activities – Using metrics to manage projects – Tracking software progress – Effectively utilizing software metrics.

Unit IV   SOFTWARE ESTIMATION   9 0 0

Problems with measurements – Avoiding obstacles and common pitfalls – Unreported and unpaid overtime – Using software metrics for effective estimating – Estimating software development projects – Enhanced estimation on time within budget – Metrics in outsourcing – Lifigaton – The product of non practicing function point metrics – Applying statistical process central to software – Metrics in E-Commerce.

Unit V   KNOWLEDGE MANAGEMENT   9 0 0

Quality information and knowledge – Need for quality information and knowledge – Define information quality – Create organizational knowledge – Manage knowledge as assets – Create customized solution – Network knowledge infrastructure.

Total: 45 hrs

Text Books:
1. Stephen H. Kan, "Metrics and Models In Software Quality Engineering", Pearson Education, 2/e 2004
2. Norman Fenton, James Bieman, "Software Metrics: A Rigorous and Practical Approach", 3/e CRC PressINC, 2013

Reference Books:
3. IT Measurement – A Practical Advice from the Experts", International Function Point Users Group, Addison-Wesley Professional 2002.

BCSE1214	ENTERPRISE APPLICATION INTEGRATION	3	0	0	3

Unit I   Enterprise Integration overview   9 0 0

Business Imperative for Enterprise Integration – Business agility – ROI of Enterprise Integration – Challenges – Business drivers – Defining Requirements – Enterprise Integration strategy.

Unit II   ENTERPRISE INTEGRATION ARCHITECHTURE   9 0 0

Overview – Business case – Components of EIA – Organizational Structure – Architectural Governance - Understanding Integration Technology – Current Integration Architecture – Technical Integration Architecture specification.

Unit III   SERVICE AND INFORMATION INTEGRATION ARCHITECTURE   9 0 0

Service Oriented Architecture – Benefits – Defining Services – Event driven service design – specification – Understanding Metadata – Metadata Architecture – standards – Information Integration Patterns – Architecture Specification.

Unit IV   PROCESS AND APPLICATION INTEGRATION ARCHITECTURE   9 0 0

Process to Business – Process Integration Technology – Process Standards – Architecture Specification - Choosing Technology - Application Integration Technology – Implementation Specification – Composite Application – Composite integration specification.

Unit V   CASE STUDY   9 0 0

Promoting Business -driven by SOA, Strategic Use of IT(using SOA to integrate IT management systems) – A case study on an Indian refinery(BPR) – Report on BPR for e-Governance projects

Total: 45 hrs

Text Books:

1. David S.Linthicum, "Enterprise Application Integration",Addison – Wesley Information Technology Services, 2006**.**
2. Martin Fowler "Patterns of Enterprise Application Architecture"Addison-Wesley Signature Series 2011

BCSE1215	WEB DATA DESIGN & MANAGEMENT	3	0	0	3

Unit I   SITE ORGANIZATION AND NAVIGATION   9 0 0

User centered design – Web medium – Web design process – Evaluating process – Site types and architectures – Navigation theory – Basic navigation practices – Search – Site maps.

Unit II   ELEMENTS OF PAGE DESIGN   9 0 0

Browser compatible design issues - Pages and Layout – Templates – Text – Color – Images – Graphics and Multimedia - GUI Widgets and Forms – Web Design patterns

Unit III   SCRIPTING LANGUAGES   9 0 0

Client side scripting: XHTML – DHTML– JavaScript– XML Server side scripting: Perl – PHP – ASP/JSP Designing a Simple web application

Unit IV   PRE-PRODUCTION MANAGEMENT   9 0 0

Principles of Project Management – Web Project Method – Project Road Map – Project Clarification – Solution Definition – Project Specification – Content – Writing and Managing content.

Unit V   PRODUCTION, MAINTENANCE AND EVALUATION   9 0 0

Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation – Case Study.

Total: 45 hrs

Text Books:

1. Themas A. Powell, "The Complete Reference – Web Design", Tata McGraw Hill, 3/e, 2003.
2. Ashley Friedlein, "Web Project Management", Morgan Kaufmann Publishers, 2001.
3. H. M. Deitel, P. J. Deitel, A. B. Goldberg, "Internet and World Wide Web – How to Program", 3/e Edition, Pearson Education 2004.

References:

1. Joel Sklar, "Principles of Web Design", Thomson Learning, 2001.
2. Van Duyne, Landay, and Hong "The Design of Sites: Patterns for creating winning websites", 2/e, Prentice Hall, 2006.
3. Lynch, Horton and Rosenfeld, "Web Style Guide: Basic Design Principles for Creating Web Sites", 2/e, Yale University Press, 2002.

BCSE1216	ADVANCED DATABASES	3	0	0	3

Unit I   RELATIONAL DATABASE ISSUES   9 0 0

ER Model – Normalization – Query processing – Query optimization – Advanced Transaction processing – Concurrency control – Recovery – Database tuning.

Unit II   DISTRIBUTED DATABASES   9 0 0

Parallel databases – Inter and intra query parallelism – Distributed database features – Distributed database architecture – Fragmentation – Distributed query processing – Distributed transactions processing – Concurrency control – Recovery – Commit protocols.

Unit III   OBJECT ORIENTED DATABASES   9 0 0

Introduction to object oriented databases – Approaches – Modeling and design – Persistence – Versioning-Query languages – Transaction – Concurrency – Multi version locks – Recovery – ODMG model.

Unit IV   ENHANCED DATA MODELS   9 0 0

Enhanced data models – Client/Server model – Very large databases – Web databases – XML and web databases.

Unit V   SPECIAL PURPOSE DATABASES   9 0 0

Active and deductive databases – Multimedia databases – Multimedia query languages – Mobile databases-Genome databases – Spatial databases- Temporal databases.

Total: 45 hrs

Text Books:
1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", McGraw Hill, 2010.
2. M.Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", 3/e, Springer, 2011.
3. R. Elmasri, S.B.Navathe, "Fundamentals of Database Systems", 5/e, Pearson Education, 2008.

References:
1. Thomas Connolly and Carlolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", 4/e, Pearson Education 2008.
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", 8/e, Pearson Education, 2006.

NETWORKING SPECIALISATION

BCSE1221	MOBILE AND WIRELESS NETWORKS	3	0	0	3

Unit I   Communication fundamentals 9 0 0

Introduction - Wireless Transmission - Frequencies for Radio Transmission - Signals - Antennas - Signal propagation - Multiplexing Modulation - Spread spectrum - Cellular systems.

Unit II MAC and Communication systems 9 0 0

Medium access control - Motivation for a specialized MAC-SDMA-FDMA-TDMA-CDMA. Telecommunication systems -GSM-DECT-TETRA-UMTS and IMT-2000, Satellite systems - Broadcast systems - Data Digital Audio Broadcasting - Digital Video Broadcasting.

Unit III Wireless Standards 9 0 0

Wireless LAN - Infrared vs. Radio Transmission - Infra structure and ad hoc Networks - IEEE 802.11 - HIPERLAN - Bluetooth. Wireless ATM - WATM Services - Reference Model - Functions - Radio Access Layer - Handover - Location Management - Addressing - Mobile Quality of Service - Access Point Control Protocol.

Unit IV Mobile Network Issues 9 0 0

Mobile network layer - Mobile IP - Dynamic host configuration protocol - Ad hoc networks-Routing Algorithm-Mobile transport layer - Traditional TCP - Indirect TCP - Snooping TCP, Mobile TCP - Fast Retransmit /Fast Recovery - Transmission/Timeout Freezing, Selective Retransmission - Transaction Oriented TCP.

Unit V   Mobile Applications 9 0 0

Support for Mobility - File systems - Consistency - World wide web - Hyper Text Transfer Protocol - Hypertext markup language –Next generation- Wireless Application Protocol.

Total: 45 Hrs

Text Books:
1. Jochen Schiller, Mobile Communications – 2/e, Pearson Education, 2008.
2. Blake, Wireless Communication Technology-Thomson Learning-2002

References:
1. Theodore S.Rappaport, Wireless Communication: Principles and practice, Prentice Hall, 2010

BCSE1222	TCP/IP DESIGN AND IMPLEMENTATION	3	0	0	3

Unit I   INTERNETWORKING   9 0 0

Inter networking issues- Architectural model-routing-internet addressing-address resolution protocol (ARP)-reverse address resolution protocol (RARP)-packet format- IP Routing -ICMP - Ipv6

Unit II   TCP   9 0 0

TCP data structures. Services - header - connection establishment and termination- interactive data flow- bulk data flow- timeout and retransmission - persist timer - keepalive timer- futures and performance

Unit III   IP IMPLEMENTATION   9 0 0

IP global software organization - routing table- routing algorithms-fragmentation and reassembly-error processing (ICMP) -Multicast Processing (IGMP)

Unit IV   TCP IMPLEMENTATION I   9 0 0

Data structure and input processing - transmission control blocks- segment format- comparison-finite state machine implementation-Output processing- mutual exclusion-computing the TCP data length

Unit V   TCP IMPLEMENTATION II   9 0 0

Timers-events and messages- timer process- deleting and inserting timer event- flow control and adaptive retransmission-congestion avoidance and control - urgent data processing and push function.

Total: 45 Hrs

Text Books:
1. Douglas E.Comer - "Internetworking with TCP/IP Principles, Protocols and Architecture", Vol. 1 & 2 4/e, Pearson Education Asia, 2003
   (Unit I in Comer Vol. I, Units II, IV & V - Comer Vol. II)
2. Kevin R. Fall, W. Richard Stevens, TCP/IP Illustrated, Volume 1: The Protocols Addison-Wesley Professional, 2011.

References:
1. Forouzan, TCP/IP protocol suite, 3/e, TMH, 2005
2. W.Richard Stevens , "TCP/IP illustrated" Volume 2 Pearson Education 2003.

BCSE1223	AD-HOC NETWORKS	3	0	0	3

Unit I   ADHOC NETWORKS SCENARIO   9 0 0
         Introduction   - Issues   –   various   ad-hoc   network   configurations,   Applications-
Issues of MAC layer and   Routing   Protocol-Proactive,   Reactive and Hybrid Routing protocols-
Hierarchical Routing-Power aware routing
Unit II   MULTICAST ROUTING AND TRANSPORT LAYER   9 0 0
         Issues-Operation of Multicast- Tree based protocols- Mesh based protocols –Energy Efficient
Multicasting- Multicast with Quality of Service Provision-TCP over Ad hoc-Transport protocol-secure
routing
Unit III   QUALITY OF SERVICE   9 0 0
         Real   time   traffic   support   –   Issues   and   challenges   in   providing   QoS   -
Classification of QoSSolutions –MAC layer classifications – QoS Aware Routing Protocols MANET-
Applications-Challenges in Mobile environment-Routing protocols in mobile Ad hoc
Unit IV   ENERGY MANAGEMENT AD HOC NETWORKS   9 0 0
         Need for Energy Management – Classification of Energy Management Schemes – Battery
Management and Transmission Power Management Schemes – System power Management schemes
Unit V   SENSOR NETWORKS   9 0 0
         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.
                                                             Total: 45 hrs

Text Book:
   1. C. Siva Ram Murthy and B.S.Manoj, "Ad hoc Wireless Networks –Architectures and Protocols',
       Pearson Education, Fifteen Impressions, 2012.
References:
   1. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers,
       2004.
   2. C.K.Toh, "Adhoc Mobile Wireless Networks", Pearson Education, 2002.

BCSE1224	3G - NETWORKING	3	0	0	3

Unit I   Communication concepts 6 0 0

Wireless communication , History of wireless communication, mobile communication fundamentals, Basic Network Architecture, roaming, handover, GSM ,IMT, CDMA2000.

Unit II 2G Architectures 12 0 0

First generation architecture, MTSO configuration, call setup, handoff, frequency reuse, channel band plan , 2G – GSM ,TDMA , CDMA architecture , traffic scenario , location update.

Unit III System Design 12 0 0

Mobile oriented voice call , digital voice channel, control channel , MAHO , Forward CDMA, Reverse CDMA , iDEN , CDPD. UMTS , migration path , services , air interface, WCDMA .

Unit IV Advanced 3G Architectures 7 0 0

Basics , 3GPP network architecture , CDMA 2000 architecture ,Uplink and down link – spreading, scrambling and modulation , UTRAN architecture , functional role of RNC, protocol.

Unit V Voice over IP Technology 8 0 0

Voice over IP , basics ,H-323 , architecture , reuse, SIP , SDP , MEGACO protocol , 3G system RF design , methodology , propagation , RF guide lines.

Total: 45 Hrs

Text Books:
1. Clint Smith, 3G wireless Network , PE, 2/e, McGraw Hill , 2006
2. Sanjiv Nanda, Third Generation Information Network, Kluwer Academic Publisher, 2006.

BCSE1225	NETWORK SECURITY AND CRYPTOGRAPHY	3	0	0	3

Unit I   SYMMETRIC CIPHERS   9 0 0

Overview - Classical Encryption Techniques – Block Ciphers and the Data Encryption Standard – Introduction to Finite Fields – Advanced Encryption Standard – More on Symmetric Ciphers – Confidentiality using Symmetric Encryption.

Unit II   PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS   9 0 0

Introduction to Number Theory – Public-Key Cryptography and RSA – Key Management - Diffie-Hellman Key Exchange – Elliptic Curve Cryptography – Message Authentication and Hash Functions – Hash and MAC Algorithms – Digital Signatures and Authentication Protocols.

Unit III   NETWORK SECURITY PRACTICE   9 0 0

Authentication Applications – Kerberos – X.509 Authentication Service – Electronic mail Security – Pretty Good Privacy – S/MIME – IP Security – Web Security.

Unit IV   SYSTEM SECURITY   9 0 0

Intruders – Intrusion Detection – Password Management – Malicious Software – Viruses and Related Threats - Viruses Countermeasures – Distributed Denial of Service Attacks - Firewalls – Firewall Design Principles – Trusted Systems.

Unit V   WIRELESS SECURITY   9 0 0

Introduction to Wireless LAN Security Standards – Technology Comparisons – Wireless LAN Security Factors – Issues in Wireless Security.

Total: 45 Hrs

Text Books:
1. William Stallings, "Cryptography And Network Security – Principles and Practices", Pearson Education, 5/e, 2011.
2. Stewart S. Miller, "Wi-Fi Security", McGraw-Hill 2003.

References:
1. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 2008.
2. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2007.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", 4/e, Pearson Education, 2007

BCSE1226	PERVASIVE COMPUTING	3	0	0	3

Unit I   Basics   9 0 0

What Pervasive Computing is all About: Times are Changing-Decentralization continues-Applied Pervasive computing-Pervasive computing principles-Pervasive Information Technology. Devices: Information Access Devices-Handheld Computers-Sub-Notebooks- Phones. Smart Identification**:** Smart Cards-Smart Labels. Embedded Controls: Smart sensors and Actuators-Smart Appliances-Appliances and Home Networking-Automotive Computing. (Chapters: 1 - 4)

Unit II   Entertainment Systems   9 0 0

Television Systems-Game Consoles. Operating Systems**:** Windows CEPalm OS-Symbian EPOC-Java Card-Windows for Smart Cards. Middleware Components**:** Programming Consumer Devices-Smart Card Programming-Messaging Components-Database Components. (Chapters: 5, 7, 8)

Unit III   WAP   9 0 0

The WAP Architecture-Wireless Application Environment. Connectivity**:** Wireless Wide Area Networks-Short Range Wireless Communication-Home Networks. Service Discovery: Universal Plug and Play-Jini-Salutation. (Chapters: 11 - 13)

Unit IV   Gateways   9 0 0

Connectivity Gateway-Wireless Gateway-Transcoding-Residential Gateway. Web Application Servers: Architecture and Components-WebSphere Application Server- WebSphere Everyplace Suite-Oracle Portal-to-Go. Device Management**:** Tasks of Device Mangement Systems-Tivoli Device Support Infrastructure-User Profiles and Directory Services. Synchronization: What Synchronization is all About-The Challenge of Synchronizing Data- Industry Data Synchronization Standards-Today's Synchronization Solution. (Chapters: 14 - 17)

Unit V   Portals and Access Services   9 0 0

Internet Portals-Wireless Portal-Broadcasting Portal. Home Services: The System View-Communication Services-Home Automation-Energy Services- Security Services-Remote Home Healthcare Services. Travel and Business Services: Travel Services-Business Services**.** Consumer Services: Interactive Advertisement-Loyalty-Shopping- Payment Services. (Chapters: 18 - 21)

Total: 45 Hrs

Text Book:
1. Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, Pervasive Computing Handbook, Springer, 2003, ISBN 3-540-6712

OS SPECIALISATION

BCSE1231	**UNIX INTERNALS**	**3**	**0**	**0**	**3**

Unit I UNIX Overview   **9 0 0**

UNIX Operating System – History – Commands – System Structure – Shell Programming – System/call – UNIX Communication – Architecture – File Sub System and Process – Sub – System – User – Kernel Modes – Process States and Transition – Sleep and Wakeup.

Unit II File System   **9 0 0**

Buffers- Structures and Representator – Implementation of System Calls.

Unit III Process Management   **9 0 0**

Structure – Context – Address Space – Creation – Scheduling – Thread implementation of System Call.

Unit IV Memory Management   **9 0 0**

Swapping – Segmentation – Demand Paging - implementation of System Call.

Unit V Drivers & Steams   **9 0 0**

Drivers – Streams – Implementation of IPC Mechanism.

                                                                                            Total: 45 Hrs

Text Book:
1. M.J.Bach, "The Design of the UNIX OS", Prentice Hall, 2007.

References:
1. W. Richard Stevens "UNIX-Network Programming". Volume1, 2/e, Pearson Education, 2008.
2. Das Sumitabha, "UNIX concepts and Applications", 4/e, TMH,2006.
3. W. Richard Stevens "UNIX-Network Programming". Volume2, 2/e, Pearson Education, 1999/6. Kay A, Robbins and Steven Robbins," Practical UNIX Programming", PHI,2009

BCSE1232	DISTRIBUTED COMPUTING	3	0	0	3

Unit I   Fundamentals: **9 0 0**

Introduction to distributed computing system, Evolution, Different models, Gaining popularity, Definition, Issues in design, DCE, Message passing-Introduction, Desirable features of a good message passing system, Issues in IPC, Synchronization, Buffering, Multidatagram, Process addressing, Failure handling, Group communication.

Unit II Remote Procedure Call   **9 0 0**

Introduction, RPC model, transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshalling arguments and results, Sever management, parameter-passing semantics, Call semantics, Communication protocols for RPCs, Complicated RPC, Client-server binding, exceptional handling, security, Lightweight RPC.

Unit III Distributed Shared Memory and Synchronization   **9 0 0**

Introduction, General architecture of DSM systems, Design and implementation issues of DSM, Granularity, Structure of shared memory space, Consistency model, Replacement strategy, Thrashing, Different approaches to DSM, Advantages of DSM, Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithm.

Unit IV Resource and Process Management   **9 0 0**

Introduction, Desirable features of a good global scheduling algorithm, Task assignment approach, Load-balancing approach, Load sharing approach, Process migration, Threads.

Unit V DFS/DCE Security   **9 0 0**

Desirable features of good DFS, File models, File accessing, models, File sharing semantics, File caching schemes, File replication, Fault tolerance, Atomic Transaction, Design principles, Authentication, Access control, Digital signatures, DCE security service.

Total: 45 Hrs

Text Book:
1. PRADEEP K. SINHA, Distributed Operating System Concepts and Design" PHI, 2012(Reprint).

References:
1. ANDREW S. TENENBAUM, Modern Operating System – 3/e, PHI, 2012.
2. AJAY D. KSHEMKALYANI , MUKESH SINGHAL, Distributed computing : principles, algorithms and systems – Cambridge University Press-2008
3. ANDREW S. TENENBAUM &MAATREN VANSTEEN, Distributed systems: Principles & Paradigms – 2/e, PHI-2012
4. HAGIT ATTIYA AND JENNIFER WELCH ,Distributed computing fundamentals, simulations and Advanced Topics – 2/e, Wiley 2004, Digitized in 2007
5. JEAN DOLLIMORE, TIM KINDBERG, AND GEORGE COULOURIS Distributed Systems: Concepts and Design – Pearson Education 4/e , 2005

BCSE1233	REALTIME SYSTEM DESIGN	3	0	0	3

Unit I   RTS overview   9 0 0

Architecture of real time systems/embedded systems-operating systems issues-performance measures-estimating program run times.

Unit II   TASK ASSIGNMENT AND SCHEDULING   9 0 0

Uniprocessor scheduling-IRIS tasks-task assignment mode changes -fault tolerance Scheduling

Unit III   PROGRAMMING LANGUAGES AND TOOLS   9 0 0

Desired characteristics based on ADA-data typing-control structures-packages-exception handling-overloading-multitasking-timing specification-task scheduling-just in time compilation-run time support.

Unit IV   REAL TIME DATABASES   9 0 0

Basic networking principles-real time databases -transaction processing-concurrency controldisk scheduling algorithms-serialization and consistency.

Unit V   FAULT TOLERANCE, RELIABILITY AND SYNCHRONIZATION   9 0 0

Fault types-fault detection and containment-redundancy-data diversity-reversal checksobtaining parameter values-reliability models for hardware redundancy-software error models-clocks-fault tolerance synchronization-synchronization and software.

                                                                    Total: 45 Hrs

Text Book:

1. C.M.Krishna, Kang.G.Shin, Realtime Systems, McGraw Hill 1997.

References:

1. Raymond j.a. Buhr -an introduction to real time systems from design to networking c and c++, Prentice Hall 1999.
2. Albert .m.k.cheng "real time systems- scheduling, analysis and verification. wiley interscience 2002
3. Jane.W.S.Liu ,"Real-Time System" Prentice Hall -2006.
4. Philip.a.laplante," real-time system design and analysis", Wiley-ieee press – 2004
5. Alan burns and andy wellings,"Real time systems and prog. Languages", 4/e,pearson, 2009.

BCSE1234	ADVANCED OPERATING SYSTEM	3	0	0	3

Unit I   MULTIPROCESSOR OPERATING SYSTEMS   9 0 0

Threads –Process synchronization –Processor scheduling-Memory management-Reliability-Fault tolerance.

Unit II   NETWORK OPERATING SYSTEMS   9 0 0

Types of NOS –NOS to LANs-Choosing and NOS-multiple NOS on a single network-NOS and network management –future trends

Unit III   DISTRIBUTED OPERATING SYSTEMS   9 0 0

Issues-Communication primitives-remote procedure call-Logical clocks-Vector clocks-distributed mutual exclusion-non token based algorithms-token based algorithms-issues in deadlock detection and resolution-centralized and distributed deadlock detection algorithms-election algorithms, classification of agreements problems-solutions to the Byzantine time agreement problem-impossibility result. Issues in load distributing –load distributing algorithms-performance comparison. Distributed file system design issues-mechanisms for building DFS-case studies.

Unit IV   DATABASE OPERATING SYSTEMS   9 0 0

Requirements-concurrency control model-serializability theory-distributed database systems-synchronization primitives-lock based and time stamp based algorithms-Fully replicated database systems.

Unit V   REAL TIME OPERATING SYSTEMS   9 0 0

Architecture of real time systems-OS issues-Performance measures-estimating program run times –uniprocessor scheduling-IRIS tasks-task assignment mode changes-fault –tolerance scheduling.

Total: 45 Hrs

Text Books:
1. Mukesh singhal,Niranjan.G.Shivarathiri-Advanced Concepts And Operating Systems,Mcgraw Hill, New York,2001(I,III,IV unit).
2. C.M.Krishna,Kang .G. Shin"Real Time Systems",Mcgraw Hill,1997(v unit)
3. Philip Hunter Network Operating Systems-Making Right Choices Addison Wesley 1995(II unit) Digitized in 2007

References:
1. Andrew S. Tanenbaum -MODERN OPERATING SYSTEMS, 3/e, 2008 Prentice Hall, (sec. 9-13 only).
2. Gary Nutt –OPERATING SYSTEMS –3/e, Pearson, 2009

BCSE1235	PARALLEL PROCESSING	3	0	0	3

Unit I   Parallel Computer Models   9 0 0

Multiprocessors and Multi computers – Multi vector and SIMD Computers - PRAM and VLSI models - Program and Network properties - Program Flow Mechanism - System Interconnection Architectures - Parallel processing Applications - speedup performance.

Unit II   Hardware Technologies   9 0 0

Processor and Memory Hierarchy: Advanced processor Technology – Super scalar and Vector Processors - Memory Hierarchy Technology - Virtual Memory Technology - Bus, Cache and Shared Memory organization.

Unit III   Processor Development Techniques   9 0 0

Linear Pipeline Processors - Non-linear pipeline processors - Instruction pipeline Design: Introduction Execution Phases, Mechanism for Instruction pipelining, dynamic instruction scheduling - Arithmetic pipeline design: Computer Arithmetic principles, Multifunctional Arithmetic pipelines – Super scalar and super pipeline design.

Unit IV   Parallel and Scalable Architectures   9 0 0

Multiprocessor system interconnection - Cache coherence and synchronization mechanisms: The Cache Coherence Problem, Snoopy Bus Protocols, Directory - based protocols - Message - passing mechanisms – multi vector multiprocessors - compound vector processing - SIMD computer organizations - Principles of multithreading - Fine-grain multi computers - Scalable and multithreaded Architectures.

Unit V   Parallel Programming Software   9 0 0

Parallel programming models - parallel languages and compliers - dependence analysis of data arrays - code optimisation and scheduling - parallel programming environments - multiprocessor UNIX design goals - master-slave and multithreaded UNIX - multicomputer UNIX extensions.

Total: 45 Hrs

Text Book:
1. Kai Hwang, "Advanced Computer Architecture - Parallelism, Scalability, Programmability", McGraw Hill, 2003, Reprint 2008.

References :
1. Michel J.Quinn, "Parallel Computing Theory and Practice", 2/e, McGraw Hill, 2002.
2. Michael A. Heroux, Padma Raghavan, Horst D. Simon," Parallel processing for scientific computing", Cambridge University Press, 2007
3. Harald Kosch, László Böszörményi, Hermann Hellwagner," Euro-Par 2003 parallel processing", Springer, 2003.

BCSE1236	FAULT TOLERANCE SYSTEMS	3	0	0	3

Unit I   FAULT TOLERANCE   9 0 0

System structuring - Recovery blocks - Early implementations and experiments - Extensions and applications of basic recovery blocks- Recovery in concurrent systems - Linguistic support for software fault tolerance.

Unit II   N-VERSION PROGRAMMING & ARCHITECTURAL ISSUES   9 0 0

Fault-tolerant software: Models and techniques - Building n-version software –Experimental investigations - A design paradigm for n-version software -The system context for fault -Tolerant software - Approaches to software-fault tolerance - Analysis of software fault toleranceDefinition and analysis of hardware software fault tolerant architectures.

Unit III   DEPENDABILITY MODELING FOR FAULT-TOLERANT SOFTWARE 9 0 0

System Descriptions- Modeling Assumptions And Parameter Definitions-System Level ModelingExperimental Data Analysis- Quantitative System-Level Analysis-Sensitivity Analysis-Decider Failure Probability

Unit IV   DISTRIBUTED RECOVERY BLOCK SCHEME   9 0 0

Non-Negligible Fault Sources And Desirable Recovery Capabilities-Basic Principles Of The DRB Scheme-Implementation Techniques-Experimental Validations Of Real-Time Recovery

Unit V   FAULT TOLERANCE ACCOMPLISHMENT   9 0 0

Hardware Fault Tolerance - Fault types-fault detection and containment-redundancy-data diversity-reversal checks obtaining parameter values-reliability models for hardware redundancy - **Storage Fault Tolence** - Backup & Recovery – Local Replication – Remote Replication, .**Software Fault Tolerence** - Testing fault tolerance using software fault insertion- Fault manager-Categorization of software faults, errors, and failures- sfit methodology-Sample sfit test plans-Application and results.

Total: 45 Hrs

Text Book:
   1. Michael R. Lyu , Software Fault Tolerance, John Wiley & Sons Ltd , 1995, Digitized in 2007
References:
   1. Hoang Pharm , Fault Tolerant Software Systems Techniques &Applications, 1992, Digitized in 2010
   2. Laura L. Pullam , Software Fault Tolerance Techniques And Implementations, Artech House, 2001

COMPUTATIONAL THEORY SPECIALISATION

BCSE1241	DESIGN OF ALGORITHMS	3	0	0	3

Unit I   Basic algorithms   **9 0 0**

    Introduction- Fundamental characteristics of an algorithm. Basic algorithm analysis –Asymptotic analysis of complexity bounds – best, average and worst-case behaviour, standard notations for expressing algorithmic complexity. Empirical measurements of performance, time and space trade-offs in algorithms. Using recurrence relations to analyze recursive algorithms – illustrations using recursive algorithms.

Unit II Fundamental Algorithmic Strategies: **9 0 0**

    Fundamental Algorithmic Strategies: Brute-Force, Greedy, Branch-and-Bound, Backtracking and Dynamic Programming methodologies as techniques for design of algorithms – Illustrations of these techniques for Problem-Solving. Heuristics – characteristics and their domains of applicability. Design of algorithms for String / Text matching problems, Huffman Code and Data compression problems, Subset-sum and Knapsack problems.

Unit III Graph and Tree Algorithms: **9 0 0**

    Graph and Tree Algorithms: Depth- and Breadth- First traversals. Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sort, Network Flow problems.

Unit IV Tractable and Intractable Problems: **9 0 0**

    Tractable and Intractable Problems: Computability.The Halting problem. Computability classes – P, NP, NP - complete and NP-hard. Cook′s theorem. Standard NP complete problems Reduction techniques.

Unit V Advanced Topics: **9 0 0**

    Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – PSPACE.

                                                 Total : 45 hrs

Text Books:
1. Introduction to Algorithms – T.H. Corman et. al., Mit Press, 2009
2. Algorithm Design – Jon Kleinberg and Eva Tardos, Pearson Education India, 2006

References:
1. **Fundamentals of Algorithms – E. Horowitz et al., Prentice Hall of India.2008**
2. **Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.**

BCSE1242	OPTIMISATION TECHNIQUES	3	0	0	3

Unit-I Unconstrained Optimization   **6 0 0**

Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions.

Unit-II Constrained Optimization   **10 0 0**

Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn – Tucker Sufficient Conditions.

Unit-III Optimization   **10 0 0**

Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg-Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Liner Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation, Multi-Objective Optimization, Branch and Bound Approaches, Genetic Algorithms and Genetic Programming, Singular Based Optimization, On-Line Real-Time Optimization, Optimization in Econometrics Approaches – Blue.

Unit-IV Optimization and Functions of a Complex Variable and Numerical Analysis   **10 0 0**

The Finite Difference Method for Poisson's Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runga-Kutta Method for Ordinary Differential Equations, Gaussian Quardative Tranzoidal Rule and Simpson's 1/3 and 3/8 Rules, the Newton Raphson in one and two Dimensions, Jacobi's Iteration Method.

Unit-V Optimization in Operation Research   **8 0 0**

Dynamic Programming, Transportation – Linear Optimization Simplex and Hitchcock Algorithms, Algorithms, Minimax and Maximum Algorithm, Discrete Simulation, Integer Programming – Cutting Plane Methods, Separable Programming, Stochastic Programming, Goal Programming, Integer Linear Programming, Pure and Mixed Strategy in theory of Games, Transshipment Problems, Heuristic Methods.

Total: 45 Hrs

Text Books
1. Winston W L: Operations Research: Applications and Algorithms, Thomson Business Press, 01-Jan-2008
2. Singiresu S. Rao, S. S. Rao, Engineering Optimization: Theory and Practice, 4/e, John Wiley & Sons, 2009

References:
1. Williams H.P.: Model Building in Mathematics Programming, 5/e, John Wiley , 2013

BCSE1243	THEORY OF COMPUTATION	3	0	0	3

Unit I   REGULAR LANGUAGE   9 0 0

Finite State Systems – Basic Definitions – Finite Automation – DFA & NFA – Finite Automation with ε-moves – Regular Expression – Equivalence of NFA and DFA – Equivalence of NFA's with and without ε -moves – Equivalence of Finite Automation and regular expressions – Pumping Lemma for Regular Sets – Problems based on Pumping Lemma.

Unit II   CONTEXT FREE LANGUAGES   9 0 0

Context Free Grammars – Derivation and Languages – Relationships between derivation and derivation trees – Ambiguity –Simplification of CEG – Greiback Normal form – Chomskey normal form – Problems related to CNF and GNF.

Unit III   PUSHDOWN AUTOMATA   9 0 0

Definition – Moves – Instantaneous descriptions – Deterministic Pushdown Automata - Pushdown automata and CFL – pumping lemma for CFL – Applications of pumping lemma

Unit IV   TURING MACHINES   9 0 0

Turing Machines – Computable Languages and Functions – Turing Machine Constructions – Storage in finite control – Multiple tracks – Checking of symbols – Subroutines – Two way Infinite Tape.

Unit V   UNDECIDABLITY   9 0 0

Properties of Recursive and Recursively Enumerable Languages – Universal Turing Machines as an undecidable problem – Universal Languages – Rice's Theorem. The Chomskey Hierarchy.

Total: 45 Hrs

Text Book:
1. J.E. Hopcroft and J.D. Ullman, " Introduction to Automata Theory, Languages and Computation", Narosa Publishers 2002

References:
1. J.C Mortin, "Introduction to Language and Theory of Computation", McGrawHill, 2002
2. John. E. Hopcroft, Rajeev Motwani, J. D. Ullman , Introduction To Automata Theory, Languages, And Computation, 3/E, Pearson Education India, 2008
3. Krithivasan Kamala, Introduction To Formal Languages, Automata Theory And Computation, Pearson , 2009

BCSE1244	ALGORTHIMIC GRAPH THEORY	3	0	0	3

Unit I Graph Theory Basics   **9 0 0**

Graphs and Graph Theory - Typical Applications- Labeled and Unlabeled Graphs - Invariants of a Graph- Order, Size, Degree-Computer representation of graphs/digraphs-Adjacency and incidence matrices - Adjacency and incidence lists -Graphical Sequence-A characterization of graphical sequences-Walks, Trails, Paths, Cycles- Subgraphs of a Graph-Induced Subgraphs-Spanning Subgraphs

Unit II Types of Graphs   **9 0 0**

Connected and Disconnected Graphs/Digraphs-Trees and Forests-Complete Graphs & Tournaments-Bipartite Graphs- Characterization of bipartite graphs-Hamiltonian Graphs-Eulerian Graphs/Digraphs- Characterization of Eulerian graphs-Iterative Graphs-Random Graphs-Other Special Graphs

Unit III Spanning Trees   **9 0 0**

Some Properties of Trees-Spanning Trees of a Graph-Optimal Spanning Trees-Different Optimality Criteria-Finding Optimal Spanning Trees-Some Applications

Unit IV Directed Trees   **9 0 0**

Directed Trees- Properties of Directed Trees-Counting Trees-Counting Spanning Trees of a Labeled Graph-Maximum Flow-Problem Description-Evolution of Maximum-Flow Algorithms-Ford-Fulkerson Results-Edmond-Karp Algorithm-MPM Algorithm-Other MFAs

Unit V Applications   **9 0 0**

Applications Of Maximum-Flow-Finding Arc-Disjoint paths-Finding edge-disjoint Paths-Finding vertex-disjoint paths-Graph Connectivities-Problem Description-Evolution of Connectivity Algorithms-Computing _ of a Graph-Computing _ of a Digraph Connectivity-Generalizations-Problem Description-Conditional Connectivities-Restricted Connectivities-Some Applications Matchings-Problem Description-Matching Algorithms-Some Application

                                                                Total : 45 hrs

Text Book:

1.Charles Golumpic "Algorithimic Graph Theory and Perfect Graphs" 2/e, Elsevier publication, 2004.

References:

1. Narsingh Deo, Graph theory with applications to Engineering and Computer Science, Prentice Hall of India (P)Ltd.,2004.
2. Alan M Gibbons, Algorithmic Graph Theory, electronic edition 2005, Cambridge University press
3. Martin Charles Golumbic , Algorithmic Graph Theory and Perfect Graphs, 2/e 2004 Elsevier
4. Dieter Jungnickel , Graphs, networks and algorithms 2/e 2005, Springer publication

BCSE1245	PRINCIPLES OF PROGRAMMING LANGUAGES	3	0	0	3

Unit I   Preliminaries   9 0 0

Programming domains, language evaluation criteria, language design - categories-tradeoffs, implementation methods, programming environments. Syntax and Semantics: Problem describing syntax-formal methods for describing syntax-recursive descent parsing, attribute grammar, dynamic semantics. Names, Bindings, Type Checking and Scopes: Names -variables-concept of binding-strong typing –type compatibility-scope and lifetime.

Unit II   Data Types   9 0 0

Primitive - character string –user- defined -array-associative array-record -unions -set-pointers-abstract data types.Expression and Assignment Statement: Arithmetic expressions-overloaded operators-type conversions-relational and Boolean expressions-assignment statements-mixed mode assignment.

Unit III   Statement - level Control Structures   9 0 0

Compound-selective-iterative statements, unconditional branching and guarded commands. Subprograms: Fundamentals -design issues-local referencing-parameter passing-overload subprograms-design issues of functions-accessing non-local environment-user defined overloaded operators-implementing sub programs**.**

Unit IV   Abstract data types   9 0 0

Concepts of abstraction, encapsulation, data abstraction, language examples- parameterized abstract data type   Support for Object Oriented Programming: Object oriented programming-design issue. Smalltalk -Example programs- features- evaluation. Support for object oriented programming in c++-java-Ada 95-eiffel, implementation of object oriented constructs.

Unit V   Concurrency   9 0 0

Subprogram level concurrency-semaphores-monitors-message passing-concurrency in Ada 95,java threads, statements level concurrency.Exception Handling: Exception handling in PL/1-ADA-C++-JAVA.

Total : 45 hrs

Text Book:
1. ROBERT. W.SEBESTA. "Concepts of programming languages"- Addison Wesley. 10/e, 2012, ISBN 0131395319

References:
1. Pratt, Zelkowitz, "Programming Languages: Design and Implementation", Pearson Eduation,4/e, 2009
2. Ravi Sethi, "Programming languages – concepts and constructs", 2/e , 2007
3. Doris Appleby & Julius J Vande Kopple, "Programming Languages Paradigm and Practice". Tata McGraw Hill,2/e 2003
4. Programming Languages Principles and Practice 2/e by Kenneth C. Louden 2003

BCSE1246	NATURAL LANGUAGE PROCESSING	3	0	0	3

Unit I IUnderstanding NLP **9 0 0**

Introduction - Issues and difficulties in natural language processing - Lingustics and computational linguistics - Language understanding and generation - Understanding of spoken, written and textual information.

Unit II Parsing **9 0 0**

Syntactic Parsing - English grammar - Structure of the sentence - Words and organization of the lexicon - Context free and context sensitive grammar - Transformational grammar - Role of syntax analysis in semantics ATN's - Definite clause grammar and WASP Parsers.

Unit III Semantic interpretation **9 0 0**

Semantic interpretation - Conceptual dependency model for semantic representation - semantic networks - Frames and scripts - Semantics in the lexicon.

Unit IV Discourse interpretation **9 0 0**

Discourse interpretation - The interconnections between pragmatics - Pragmatics in discourse analysis - Speech acts plan - Theory of speech acts - Semantic network Frame and scripts - Semantics in the lexicon.

Unit V Natural language generation systems **9 0 0**

Generation - Strategies for generation - Planning English referring expressions- KING, a Natural language generation systems. Typical systems -ELIZA - Baseball - GUS - PARRY - LADDER - SOPHILE & POET current trends in NLP.

Total : 45 hrs

Text Book:

1. James Allen Benjamin Cummings, "Natural language understanding", Pearson Education. 2007

References:

1. Grosz, Jones & Webber, Readings in Natural Language Processing, Morgan Kanfamann Publishers, 2005.
2. Daniel Jurafsky and James H. Martin, Speech-Language-Processing PHI,2008.
3. Natural Language Processing and Information Retrieval ,Oxford Higher Education, 2008.

VLSI & EMBEDDED SPECIALISATION

BCSE1251	VLSI TECHNOLOGY	3	0	0	3

Unit I VLSI Design Flow   **9 0 0**

Design hierarchy concepts of regularity, modularity & locality VLSI Design styles – CMOS fabrication Technology- Fabrication Process flow- basic steps, CMOS n-well process, Advanced CMOS fabrication technologies, layout design rules- Full – custom Mask Layout design –CMOS Layout design rules – CMOS inverter Layout design – Layout of CMOS NAND & NOR gates – Complex CMOS Logic gates.

Unit II Parasitic Extraction & Performance Estimation from Physical Structure   9 0 0

Introduction – Reality with inter-connection –MOSFET capacitances-interconnect capacitance estimation – interconnect resistance estimation.

Unit III Clock Signals & System Timing   **9 0 0**

On chip clock generation & distribution using ring & pierce crystal oscillator – non – overlapping clock signals and gate level implementation – H-tree clock distribution N/W – clock skew reduction – Zero – Skew clock routing N/W- Clock distribution N/W for DEC alpha Op chips.

Unit IV Testability of Integrated Systems-VLSI for Fuzzy Logic Systems   9 0 0

Design constraints – Testing – The rule of ten – terminology – Failures in CMOS – Combinational Logic Testing – Practical Ad-Hoc DFT guidelines –Scan design techniques- Integrated i m p l ementations of FLC, Digital implementation of FLC's, Analog implementation of FLC's, Mixed digital /analog implementations of Fuzzy systems, CAD automation for FLC DESIGN, NN implementing fuzzy systems.

Unit V Arithmetic for Digital Systems   **9 0 0**

Introduction – notation systems – Principles of generation & propagation – 1 bit full adder – Enhancement Techniques for Adders – multi operand –Adders – Multiplication – Addition and Multiplication in Galois Fields GF(2n).

Total: 45 Hrs

Text Books:

1. CY Cheng., S.M SZE., "ULSI Technology"., McGraw-Hill International Editions, 1996. Digi 2007.
2. Douglas A. Pucknell and Kamran Eshraghian, "Basic VLSI Design Systems and circuits", Prentice Hall of India Pvt Ltd., 1994, 3/e.
3. Randall .L.Geiger and P.E.Allen, VLSI Design Techniques for Analog and Digital Circuits, McGraw Hill 2010 Reprint.
4. Horspool., Gorman., "The Asic Handbook" Prentice Hall 2001, Digitized in 2007.

BCSE1252	SYSTEM MODELING USING HARDWARE DESCRIPTION LANGUAGES	3	0	0	3

Unit I Hardware Definition Languages   **9 0 0**

VHDL & VERILOG Introduction and abridgment   Date flow decryption – Structural-connected Blow.

Unit II Operators & Statements   **9 0 0**

Behaviour Description using Standard library – operators in VHDL Vector and scalar operations – Delay model – sequential statement – signal and process.

Unit III Implementation   **9 0 0**

Implementation of combinational and sequential circuit using VHDL package.

Unit IV Verilog Design   **9 0 0**

Verilog and - Design function using Verilog –Levels of synthesizing Verilog Designing N!W using Verilog – Simple design – wires – wire assignments – Design.

Unit V Testing & Case studies   **9 0 0**

Test Benches –Response capture – RTL Verilog – If statement – Synthesis latches.

Case Study

Design of universal asynchronous Receivers – Implementation of NAND – Latch. 16 bit counting, D type Edge triggered flip flop clock for counter –Fibonacci number generator- programmer using hand notation spice modeling of circuit.

                                                                            Total: 45 Hrs

Reference Books:
1. Mohammed Ismail., "Analog VLSI Integrated Circuits", PHI.,1998, Digitised in 2007
2. Peter J.Ashenden, "The Designer's guide to VHDL", Morgan Kaufmann,3/e, 2010
3. Grey, Hurst Luwis, Mayer., "Analysis and Design of Analog Integrated Circuits", 5/e, John Willey,2009.
4. J.Bhaskar , "A VHDL Primer",3/e, PHI, 2004
5. Charles.H,Roth, "Digital system design using VHDL",2/e, PWS Publishing Co.,2005

BCSE1253	VLSI DESIGN	3	0	0	3

Unit I   MOS Technology and Circuits   9 0 0

Mos Technology and VLSI, Process parameters and considerations for BJT, MOS and CMOS, Electrical properties of MOS circuits and Device modeling-MOS Circuit Design Process - MOS Layers, Stick diagram Layout diagram Propagation delays, Examples of combinational logic design, Sealing of MOS circuits, Capacitance Calculations

Unit II   Digital Circuits and Systems   9 0 0

Programmable Logic Array (PLA) and Finite State Machines, Design of ALUs, Memories and Registers.

Unit III   Analog VLSI and High Speed VLSI   9 0 0

Introduction to Analog VLSI, Realisation of Neural Networks and Switched capacitor filters, sub-micron technology and GaAs VLSI technology.

Unit IV   Hardware Description Languages   9 0 0

VHDL background and basic concepts, Structural specifications of hardware design organisation and parameterisation.

Unit V   VLSI Design   9 0 0

VLSI applied to communication circuits, Filter design, VLSI for RF circuits, VLSIarchitectures for reduced critical path & low power design

Total: 45 Hrs

Text Books:
1. Wayne Wolf, Modern VLSI Design: IP-Based Design, 4/e, Prentice Hall, 2009.
2. Randall .L.Geiger and P.E.Allen, VLSI Design Techniques for Analog and Digital Circuits, McGraw Hill, 1990, Digitized in 2007

References:
1. Douglas A. Pucknell and Kamran Eshraghian, Basic VLSI Design, Prentice Hall of India Pvt Ltd., 1994, 3/e, Digitized in 2007

BCSE1254	COMPUTER AIDED DESIGN OF VLSI	3	0	0	3

Unit I   VLSI Methodologies   **9 0 0**

VLSI Methodologies – VLSI Physical Design Automation – Design and Fabrication of VLSI Devices – Fabrication process and its impact on Physical Design.

Unit II   VLSI Design Automation Tools & Algorithms   **9 0 0**

VLSI Design Automation Tools - Data structures and Basic Algorithms – Algorithms Graph Theory and computational complexity – Tractable and Intractable problems

Unit III   General purpose methods   **9 0 0**

General purpose methods for combinational optimization – Partitioning – Floor planning and pin assignment – placement – Routing Clock Routing Algorithms - Compaction

Unit IV   Simulation   **9 0 0**

Simulation – Logic synthesis – Verification – High-level synthesis – compaction.

Unit V   Automation & Case studies   **9 0 0**

Physical Design Automation of FPGAs, MCMS

Case Study

Floor planning billion-gate design. Test vector generation design for testing fan out coverage

Total: 45 Hrs

Text Books:
   1. N.A. Sherwani, "Algorithms for VLSI Physical Design Automation".3/e, Digitized in 2007.

References:
   1. S.H.Gerez, "Algorithms for VLSI Design Automation",2006, Wiley(I), 2/e, Reprint 2008.

BCSE1255	EMBEDDED SYSTEM DESIGN	3	0	0	3

Unit I   Introduction To Embedded Systems   **9 0 0**

Definition and Classification – Overview of Processors and hardware units in an embedded system-Software embedded into the system – Exemplary Embedded systems-Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.

Unit II   Devices And Buses For Devices Network   **9 0 0**

I/O Devices – Device I/O Types and examples – Synchronous – ISO – Synchronous and Asynchronous Communications from serial Devices – Examples of Internal Serial – Communication Devices – UART and HDLC – Parallel Port Devices – Sophisticated interfacing features in Devices / Ports – Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses – ISA, PCI, PCI-X, cPCI and advanced buses

Unit III Programming Concepts And Embedded Programming In C, C++   **9 0 0**

Programming in assembly language (ALP) vs. High level language – C Program Elements, Macros and functions – Use of Pointers – NULL pointers – Use of Function calls – Multiple function calls in a Cyclic order in the Main function pointers – Function Queues and Interrupt Service Routines Queues, Pointers – Concepts of EMBEDDED PROGRAMMING IN C++ - Object Oriented Programming – Embedded Programming in C++, 'C' Program compilers – Cross compiler – Optimization of memory codes.

Unit IV Real Time Operating Systems – Part – 1   **9 0 0**

Definitions of process , tasks and threads – Clear cut distinction between functions – ISRs and tasks by their characteristics – Operating System Services – Goals – Structures – Kernel – Process Management – Memory Management – Device Management – File System Organization and Implementation – I/O Subsystems – Interrupt Routines Handling in RTOS, REAL TIME OPERATING SYSTEMS: RTOS Task Scheduling models – Handling of task scheduling and latency and deadlines as performance metrics – Co operative Round Robin Scheduling–Cyclic Scheduling with Time slicing (Rate Monotonics Co operative Scheduling)– Preemptive scheduling model strategy by a scheduler – critical section service by a Preemptive scheduler – Fixed (Static) Real time scheduling of tasks – INTER PROCESS COMMUNICATION AND SYNCHRONIZATION – Shared data problem – Use of semaphore(s) – Priority inversion problem and Deadlock situations – Inter process communications using signals – semaphore Flag or mutex as Resource key–Message Queues –Mail boxes – Pipes – Virtual (Logical) Sockets – Remote Procedure Calls (RPCs).

Unit V   Real Time Operating Systems – Part – 2   **9 0 0**

Study of Micro C/OS-II or Vx works or any other popular RTOS – RTOS system level functions – Task service functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore related functions – Mailbox related functions   – Queue related functions   – Case studies of programming with RTOS   – Understanding case definition – multiple tasks and their functions – creating a list of tasks – Function and IPCs – Exemplary Coding steps.

Total No of periods: 45hrs

Text Book:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TMH, 2/e, 2008.

References:

1. Steve Heath, Embedded Systems Design, Second Edition - 2003 Newnes
2. Wayne Wolf, Computers as Components: Principles of embedded computing system design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001
3. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware / Software Introduction, John Wiley, 2002
4. Marilyn wolf," computers as components:principle of embedded computing systems design",third edition 2012

BCSE1256	MICRO CONTROLLER ARCHITECTURE AND DESIGN	3	0	0	3

Unit I   Microcontroller Organization & Architecture   9   0 0

Elements of a computer – Microprocessor – Microcontroller – Instruction sets, formats, addressing modes – Microcontroller software development process – Real Time programming requirements – Interfacing C and assembly language.

Unit II   8051 Microcontroller Architecture & Programming   9 0 0

8051 Architecture – Pin Diagram – I/O ports – Instruction set of 8051 – Addressing modes – Data transfer instructions – Arithmetic and logical instructions – Jump and Call instructions – Interrupts handling – Timers & Counters.

Unit III   Fundamentals of Interfacing   9   0 0

Fundamentals of interfacing- Input/output ports (i/o) ports (serial i/o ports, parallel i/o ports), analog to digital (a/d) and digital to analog (D/A) conversion, programmable timers, interrupt handling, serial I/O, synchronous vs. asynchronous serial I/O, asynchronous transmission format, synchronous transmission format (SDLC), RS-232, terminal interfacing, modem interfacing, bit banging.

Unit IV   Introduction to ARM   9 0 0

ARM Processor Architecture and Pipelining – Data Paths – Instruction Decoding – Instruction Set – Addressing Modes – Thumb Instruction Set – Code Sequences.

Unit V   Advanced Microcontroller   9 0 0

ARM7TDM1 – ARM9TDM1 – Advanced Microcontroller Bus Architecture – ARM9E – SARM10 – StrongARM - XScale

Total = 45hrs

Text Books:
1. K.Kenneth   Hintz,   Daniel   Tabak,   "Microcontrollers   –   Architecture, Implementation & Programming" TataMcGraw Hill, 2005.
2. David Seal, "ARM Architecture Reference Manual", 2nd Edition, Addison Wesley, 2007.

Reference Books:
1. Mohammed Ali Mazidi, Janice Gillispie Mazidi "The 8051 Microcontroller and Embedded System", 2nd Edition, Pearson Education, 2005.

BIOINFORMATICS SPECIALISATION

BCSE1261	**BIO INFORMATICS**	**3**	**0**	**0**	**3**

Unit I   Basics   9 0 0

Life in Space and Time – Dogmas – Data Archives – WWW – Computers – Biological Classification – Use of Sequences – Protein Structure – Clinical Implications.

Unit II   Genome Organization   9 0 0

Genomics and Proteomics – Eavesdropping on transmission of genetic information – Genomes of Prokaryotes – Genomes of Prokaryotes – Genomes of Eukaryotes – Human Genome – SNPs, Genetic Diversity – Evolution of Genomes.

Unit III   Archives and Information Retrieval   9 0 0

Introduction – The archives – Gateways to Archives

Unit IV   Alignments and Phylogenetic Trees   9 0 0

Introduction to Sequence Alignment – The dotplot – Dotplots and Sequence Alignments – Measures of sequence similarity – Computing the Alignment – The dynamic programming algorithm – Significance of alignments – Multiple sequence alignment – Applications, Phylogeny – Phylogenetic trees.

Unit V   Protein Structure and Drug Discovery   9 0 0

Protein Stability and Folding – Applications of Hydrophobicity – Superposition of structures – DALI, Evolution of Protein Structures – Classification of Protein Structures – Protein Structure prediction and modeling – Assignment of protein structures to genomes – Prediction of protein function – Drug discovery and development.

Total : 45hrs

Text Book:
   1. Arthur M Lesk, "Introduction to Bioinformatics", Oxford University Press, India, 2008.
Reference:
   1. Attwood T K and Parry – Smith D J, "Introduction to Bioinformatics", Pearson Education India, New Delhi, 2001.

BCSE1262	BIOLOGICAL DATABASE AND DATA ANALYSIS	3	0	0	3

Unit I Introduction to Bioinformatics   **9 0 0**

   Nature of biological data - Overview of available Bioinformatics resources on the web NCBI/EBI/EXPASY etc- Biological Databases: Nucleic acid sequence databases GenBank/EMBL/DDBJ - Biological Databases: Protein sequence databases - PIR-PSD, SwissProt, UniProtKB Database search engines Entrez SRS

Unit II Overview/concepts in sequence analysis   **9 0 0**

   Overview/concepts in sequence analysis - Pairwise sequence alignment algorithms - Needleman & Wunsch -Smith & waterman -Scoring matrices for Nucleic acids & proteins:MDM ,BLOSUM, CSW Database Similarity Searches:BLAST, FASTA

Unit III Multiple sequence alignment :   **9 0 0**

   Multiple sequence alignment :PRAS,CLUSTALW - Biological databases: Genome & genetic Disorders,Genome databases: Human, model organisms, microbes & viral ,OMIM- Biological databases: structural databases-PDB, NDB,CCSD - Derived databases: Prosite, BLOCKS, Pfam/Prodom, Exporting GI list, Batch retrieval

Unit IV Exploring & querying the Database   **9 0 0**

   Exploring the integrated database system at EBI server and searching the EMBL Nucleotide database using the SRS search engine- Exploring & querying SWISSPROT & UniProtKB - Exploring and querying the PIR database - Pair-wise global alignments of protein and DNA sequences usingNeedleman-Wunsch algorithm & interpretation of results to deduce homology between the sequences, use of scoring matrices - Pair-wise local alignments of protein and DNA sequences using Smith-Waterman algorithm and interpretation of results

Unit V Study & Visualisation of Databases   **9 0 0**

   Database (homology) searches using different versions of BLAST and interpretation of the results to derive the biologically significant relationships of the query sequences (proteins/DNA) with the database sequences- Database (homology) searches using different versions of FASTA & interpretation of the results to derive the biologically significant relationships of the query sequences (proteins/DNA) with the database sequences - Multiple sequence alignments of sets of sequences using web-based and stand-alone version of CLUSTAL. Interpretation of results to identify conserved and variable regions and correlate them with physico-chemical & structural properties - Exploring and using the derived databases: PROSITE, PRINTS, BLOCKS, Pfam and Prodom for pattern searching, domain searches etc - Search & retrieval: genomic and OMIM data at NCBI server -Studying the format & content of structural databases & visualization of structures using Rasmol, Cn3D and other utilities

                                   Total: 45 Hrs

Text Book:

 1. Andreas D. Baxevanis, B. F. Francis Ouellette , Bioinformatics: A Practical Guide to the analysis of Genes and Proteins (2/e), New York, published by John Wiley & Sons, Inc. Publications, 2005.

References:

 1. Attwood, T.K. & Parry-Smith, D.J. Delhi, Introduction to Bioinformatics, Pearson Education Ptd.Ltd., 1999.

2. David W.Mount , Bioinformatics: Sequence and Genome Analysis, New York,by Cold Spring Harbor Laboratory Press, 2004. 2/e
3. Baxevanis, A.D., Davison, D.B., Page, R. D. M. & Petsko, G.A., Current Protocols in Bioinformatics, New York, by John Wiley & Sons Inc., 2003.

BCSE1263	**CELL BIOLOGY AND GENETICS**	**3**	**0**	**0**	**3**

Unit I Prokaryotic and eukaryotic cells   **9 0 0**

      membranes and cellular compartmentation; An overview of organelles, (mitochondria, chloroplasts, ER, Golgi, lysosomes and peroxisomes; nucleus and nucleolus) and organelle genetic systems - Cellular membranes: Structure, transport, channels, carriers, receptors, endocytosis, membranepotentials.

Unit II Cell motility and shape   **15 0 0**

      cytoskeletal elements, cilia and flagella; motor proteins - Cell-cell interactions and signal transduction: Intercellular junctions, signaling by hormones and neurotransmitters; receptors, G-proteins, protein kinases and second messengers - Protein traffic in cells: Protein sorting and signal sequences; protein translocation in ER and vesicular transport to Golgi, lysosmes and plasma membrane; protein import into nuclei, mitochondria, chloroplasts and peroxisomes - Cell cycle and its regulation; events during mitosis and meiosis

Unit III Science of genetics   **7 0 0**

      – objectives, terminologies, methods - Mendelian principles of inheritance, sex linked inheritance - Chromosomes, linkage, linkage maps and recombination

Unit IV Mutations   **7 0 0**

      – molecular, gene/point and chromosomal - Genetics of viruses and bacteria - Phenotype and genotype relationships, role of environment, from gene to phenotype, gene interactions

Unit V Study of quantitative traits   **7 0 0**

      - Genetics of populations, genetics and evolution - Genetics and diseases, cancer

Total: 45 Hrs

Text Books:

1. Essential Cell Biology (2nd edition), by B. Alberts, D. Bary, K. Hopkin, A. Johnson, J. Lewis, M. Raff, K. Roberts & P. Walter, Garland Science, 2004.

2. Principles of Genetics (8th edition) by E. J. Gardner, M. J. Simmons & D. P. Snustad John Wiley & Sons, 2002.

Reference Books:

1. Concepts in Genetics (7th edition) by W. S. Klug & M. R. Cummings, Pearson Education, 2003.

2. Genetics: A Conceptual Approach by B. A. Pierce, W. H. Freeman & Company, 2003.

3. Molecular Biology of the Cell (4th edition) by B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts & P. Walter Garland Science, 2002.

4. The Cell: A Molecular Approach by G. M. Cooper, A. S. M. Press, 2000.

5. Molecular Cell Biology (5th edition) by H. Lodish, A. Berk, P. Matsudaira, C.A. Kaiser, M. Krieger, M. P. Scott, S. L. Zipursky & J. Darnell, W. H. Freeman & Company, 2004.

BCSE1264	PROGRAMMING IN PERL	3	0	0	3

Unit I Introduction 9 3 0

PERL, Perl in Bioinformatics, History of Perl, Availability, Support, Basic Concepts- Scalar Data, Scalar Operators, Scalar Variables, Scalar Operators and Functions - Arrays and List Data, Literal Representation, Variables, Array Operators and Functions, Scalar and List Context- Control Structures: Statement Blocks – Hashes, Hash Variables, Literal Representation of a Hash, Hash Functions, Hash Slices - BasicI/O

Unit II Regular Expressions 6 0 3

Concepts About Regular Expressions, Simple Uses of Regular Expressions, Patterns, More on the Matching Operator, Substitutions, The split and join Functions - Subroutines: System and User Functions, The local Operator, Variable-length Parameter Lists, Notes on Lexical Variables - Miscellaneous Control Structures - File handles and File Tests, Opening and Closing a File handle, Using Pathnames and Filenames, A Slight Diversion: die, Using File handles, The -x File Tests, The stat Function

Unit III   Formats 6 0 0

Defining a Format, Invoking a Format - Directory Access: Moving Around the Directory Tree, Globbing, Directory Handles, Opening and Closing a Directory Handle, Reading a Directory Handle - File and Directory Manipulation

Unit IV Process Management 6 0 0

Using system and exec, Using Back-quotes - Other Data Transformation: Finding a Substring, Extracting and Replacing a Substring - Formatting Data: Sorting, Transliteration System Information: Getting User and Machine Information, Packing and Unpacking Binary Data

Unit V Database Manipulation 9 0 3

DBM Databases and DBM Hashes, Opening and Closing DBM Hashes, Fixed-Length Random-Access Databases, Variable-Length (Text) Databases, Win32 Database Interfaces (1) - CGI Programming: The CGI.pm Module, Your CGI Program in Context, Simplest CGI Program, Passing Parameters via CGI, Perl and the Web Object oriented perl: Introduction to modules, Creating Objects - Bioperl: Introduction, Installation procedures, Architecture, Uses of bioperl

Total: 45 Hrs

Text Books:
1. Beginning Perl for Bioinformatics by James Tisdall, O-Reilly, 2007

Reference Books:
2. Developing Bioinformatics Computer Skills by Cynthia Gibas, Per Jambeck, O-Reilly, 2001
3. Learning Perl by Randal L. Schwartz, Tom Phoenix, O-Reilly, 2011
4. Programming Perl by Larry Wall, Tom Christiansen, Jon Orwant, O-Reilly, 2012.
5. Programming the Perl DBI: Database programming with Perl by Alligator Descartes, Tim Bunce, O-Reilly,2011
6. Advanced Perl Programming: Foundations and techniques for Perl by Sriram Srinivasan, 1997

BCSE1265	MACHINE LEARNING MODELS IN BIOINFORMATICS	3	0	0	3

Unit I   Machine-Learning Foundations   9 0 0

The Probabilistic Framework -Introduction: Bayesian modeling The Cox Jaynes axioms - Bayesian inference & induction -Model structures: graphical models & other tricks - Probabilistic Modeling & Inference: Examples -The simplest sequence models - Statistical mechanics

Unit II   Machine Learning Algorithms   9 0 0

Introduction -Dynamic programming -Gradient descent - EM/GEM algorithms –Markov chain Monte-Carlo methods - Simulated annealing – Evolutionary & genetic algorithms. Learning algorithms: miscellaneous aspects

Unit III   Neural Networks   9 0 0

The Theory -Introduction - Universal approximation properties – Priors & likelihoods - Learning algorithms: backpropagation - Neural Networks: Applications - Sequence encoding & output interpretation- Sequence correlations & neural networks – Prediction of protein secondary structure - Prediction of signal peptides & their cleavage sites - Applications for DNA & RNA nucleotide sequences - Prediction performance evaluation - Different performance measures

Unit IV   Hidden Markov Models   9 0 0

Introduction -Prior information & initialization - Likelihood & basic algorithms - Learning algorithms -Applications of HMMs: general aspects -Protein applications - DNA & RNA applications - Advantages & limitations of HMMs

Unit V   Probabilistic Graphical Models in Bioinformatics   9 0 0

Markov models & DNA symmetries -Markov models & gene finders - Hybrid models & neural network parameterization of graphical models -The single-model case - Bi-directional recurrent neural networks for protein secondary structure prediction

Total: 45 Hrs

References:
1. Pierre Baldi and Søren Brunak, Bioinformatics: the Machine Learning Approach – Publisher: MIT Press,1998, 2/e 2001
2. David W. Mount, Bioinformatics: Sequence and Genome Analysis, CSHL Press , 2004

BCSE1266	ADVANCED TECHNIQUES FOR SEQUENCE AND STRUCTURE ANALYSIS	3	0	0	3

Unit I Advanced Techniques for Sequence Analysis   **9 0 0**

    Sequence Profiles: Derivation, Databases, Application, Gapped BLAST, PSI-BLAST, PHI-BLAST - Advanced Techniques for Structure Analysis: Molecular replacement method, Direct method & Fiber diffraction,Methods for Comparison of 3D structures

Unit II Optimization techniques in Sequence Alignments   **9 0 0**

    Application of the optimization techniques in Sequence Alignments, Prediction of Protein Structure Docking Simulations

Unit III Advance techniques in Prediction of 3D Structure   **9 0 0**

    Hidden Markov Model,Neural networks Rossetta Stone

Unit IV Molecular Dynamics Simulations & Monte Carlo Methods   **9 0 0**

    Electrostatics of biomolecules, Simulations of Bio-macromolecular Structures in Water & membrane,Free energy perturbation method

Unit V Simulated Annealing   **9 0 0**

    Multiple Sequence Alignments,Simulations of Bio-macromolecular Structures Designing of molecules like drug, inhibitors using Structure based & ligand based docking Methods, Different Scoring schemes

Total: 45 Hrs

Text Books:
1. Hidden markov models for Bioinformatics by Koski, T, Dordrecht Kluwer, Academic Publishers, 2001.
2. Goldberg, D.E , Genetic algorithms in search, optimization an machine learning , Pearson Education Pte. Ltd., 2002
3. Biological Sequence Analysis: probabilistic models of proteins and nucleic acids by Durbin, R., Eddy, S., Krogh, A. & Mitchison, G.: Cambridge Univ. Press, Cambridge, 1998.

References:
1. Genetic algorithms in molecular modeling by Devillers, J., Ed, 1996.
2. Protein Bioinformatics: An Algorithmic Approach to Sequence and Structure Analysis by Ingvar Eidhammer, Inge Jonassen, William R. Taylor John Wiley, 2003.

DIGITAL IMAGE PROCESSING SPECIALISATION

BCSE1271	**DIGITAL IMAGE PROCESSING**	3	0	0	3

Unit I   Fundamentals   9 0 0

Digital image representation-Fundamental steps in image processing -Elements of digital image processing systems,Digital Image Fundamentals - :Elements of visual perception-A simple image model - Sampling and quantization -Some basic relationship between pixels-Imaging geometry -Photographic film.

Unit II   Image Transforms   9 0 0

Introduction to the Fourier transform -The Discrete Fourier transform -Some properties of the two dimensional Fourier transform -The fast Fourier transform-Other seperable image transforms-The hotelling transform.

Unit III   Image Enhancement: 9 0 0

Background -Enhancement by point Processing -Spatial filtering-Enhancement in the frequency domains -Generations of the spatial masks from frequency Domain specifications-Color image processing -Image Restoration: Degradation Model -diagonalization of Circulant and Block circulant Matrices - Algebraic approach to restoration-Inverse filtering -Least mean square filter -constrained least square restoration-Restoration in spatial domain-Geometric transformation.

Unit IV   Image compression   9 0 0

Fundamentals -image Compression models -Elements of information Theory - Error-free Compression - Lossy Compression - Image Compression standards, Image Segementation : Edge linking and boundary detection - Thresholding - Region - Oriented segmentation - The use of motion in segmentation.

Unit V   Representation and Description   9 0 0

Representation Schemes - Boundary descriptors - Morphology - Relational descriptors, Recognition and Interpretation: Elements of image Analysis - Pattern and pattern classes - Decision theoretic methods - Structural Methods - Interpretation.

Total : 45hrs

Text Book:
1. RAFAEL C.GONZALEZ and RICHARD E.WOODS ,Digital Image Processing , 2008, Prentice Hall.

References :
1. Sreedhar,Digital Image Processing,OUP India, 2011
2. M.A.SID AHMED, Image Processing Theory, Algorithm and Architecture - McGraw Hill, 1995, Digitized in 2009
3. DONALD EDWIN PEARSON, Image Processing, McGraw Hill, 1991, Digitized in 2007

BCSE1272	PATTERN RECOGNITION AND NEURAL NETWORKS	3	0	0	3

Unit I BASICS OF PATTERN RECOGNITION 9 0 0

Introduction to pattern recognition – Features, Feature Vectors and Classifiers - Supervised versus Unsupervised Pattern Recognition - Classifiers Based on Bayes Decision Theory

Unit II - LINEAR CLASSIFIERS AND NON LINEAR CLASSIFIERS 9 0 0

Linear Discriminant Functions and Decision Hyperplanes - The Perceptron Algorithm - Least Squares Methods - Sum of Error Squares Estimation - The XOR Problem - Three Layer Perceptrons - The Backpropagation Algorithm - Networks with Weight Sharing

Unit III FEATURE SELECTION AND TEMPLATE MATCHING 9 0 0

Preprocessing - Feature Selection Based on Statistical Hypothesis Testing - Class Separability Measures - Feature Subset selection - Similarity Measures Based on Optimal Path Searching Techniques - Measures Based on Correlations

Unit IV NEURAL NETWORKS 9 0 0

Artificial neurons, Neural networks and architectures – Supervised Learning I – Supervised Learning II

Unit V ANN:PATTERN RECOGNITION PERSPECTIVE 9 0 0

Neural Networks: A Statistical Pattern Recognition Perspective – Support Vector Machines and Radial Basis Function Networks.

Total : 45Hrs

Text Books:

1. Sergios theodoridis, Konstantinos koutroumbas , Pattern Recognition, 4/e, Academic Press, 2008.

Reference Books:
2. B.Yegnanarayana**,** Artificial Neural Networks, PHI Learning Pvt. Ltd., 2004
3. Sathish Kumar, Neural Networks – A Class Room Approach, Tata McGraw Hill , 2008

BCSE1273	MEDICAL IMAGING TECHNIQUES	3	0	0	3

Unit I   IMAGE FUNDAMENTALS   9 0 0

Image perception, MTF of the visual system, image fidelity criteria, image model, image sampling and quantization - two dimensional sampling theory, image quantization, optimum mean square quantizer, image transforms - 2D-DFT and other transforms.

Unit II   IMAGE PREPROCESSING AND ANALYSIS   9 0 0

Image enhancement - point operation, histogram modeling, spatial operations, transforms operations. Image restoration-image degradation model, inverse and Wiener filtering. Image analysis - spatial feature extraction, edge detection, image segmentation classification techniques - statistical methods, neural network approaches.

Unit III   RECONSTRUCTION OF CT AND MRI IMAGES.   9 0 0

Image reconstruction from projections - Radon transforms, filter back projection algorithm, algebraic methods, 3D tomography, imaging methods in CT images, imaging methods in magnetic resonance imagers, Fourier reconstruction of magnetic resonance images.

Unit IV   TRANSMISSION OF MEDICAL DATA   9 0 0

Medical image data compression and transmission, transform coding pixel coding, predictive coding, interframe coding.

Unit V   SELECTED TOPICS IN MEDICAL IMAGE PROCESSING   9 0 0

Application of image processing techniques in thermography, SPECT, PET, DSA, AI techniques in medical imaging. Bio magnetic diagnosis in connection with medical imaging of CT or MRI. Software implementation of image processing algorithms on medical images, Design consideration for RF cage

Total : 45 hrs

Text Books:
1. Albert Macouskl, Medical Imaging Systems, Prentice Hall New Jersery, 2005.
2. Anup Majumder, Medical Imaging Systems: Principles, Analysis, and Applications, Cengage Learning, 2012, ISBN 1418063134, 9781418063139

References:
1. Gerald Schaefer, Aboul Ella Hassanien, J. Jiang, Computational Intelligence in Medical Imaging: Techniques and Applications, CRC Press, 2009, ISBN 1420060597, 9781420060591
2. Anil K. Jain, Fundamental of Digital Image Processing, Prentice Hall of India Pvt Ltd., New Delhi, 2001.

BCSE1274	DIGITAL IMAGE PROCESSING ALGORITHMS	3	0	0	3

Unit I   Digital image transform algorithms   9 0 0

Two-dimensional discrete Fourier transform   - Row-column FFT algorithm - Memory problems in 2-d DFT calculations - Vector-radix fast Fourier Transform algorithm - Polynomial transform FFT - Two-dimensional power spectrum estimation **-** Discrete cosine transform - Two-dimensional discrete cosine transform - Discrete wavelet transform

Unit II   Digital image filtering and enhancement   9 0 0

Direct implementation of two-dimensional FIR digital filters   - Fast Fourier transform implementation of FIR digital filters - Block methods in the linear convolution calculation. Inverse filter implementations - Wiener filters - Median filter algorithms - Digital filters based on order statistics - Signal Adaptive order statistic filters   - Histogram and histogram - equalization techniques - Pseudo coloring algorithms - Digital image half toning - Image interpolation algorithms - Anisotropic Diffusion - Image Mosaicing - Image watermarking

Unit III   Edge detection and Image Segmentation algorithms   9 0 0

Edge detection - Edge thresholding - Hough transform - Edge-following algorithms - Image segmentation by thresholding - Split/merge and region growing algorithms - Relaxation algorithms in region analysis - Connected component labeling - Texture description

Unit IV   Shape description   9 0 0

Chain codes - Polygonal approximations - Fourier descriptors - Fourier descriptors - Quad trees - Pyramids - Shape features - Moment descriptors - Thinning algorithms - Mathematical morphology - Grayscale morphology - Skeletons - Shape decomposition - Voronoi tesselation - Watershed transform - Face detection and recognition

Unit V   Digital Image Processing case study with EIKONA   9 0 0

Structure - BW image processing -   Color Image Processing - Arts module - Crack Restoration - Watermark module - EIKONA Source, Library/DLL

Total : 45 Hrs

Text Book:
   1. Ioannis Pitas, Digital image processing algorithms and applications, Wiley, 2000.
References:
   1. Rafael C.Gonzalez and Richard E.Woods. Digital Image Processing - 2008, Prentice Hall.
   2. M.A.Sid Ahmaed, Image Processing Theory, Algorithm and Architecture - McGraw Hill, 1995, Digitised in 2009.

BCSE1275	INTELLIGENT IMAGE DATABASES	3	0	0	3

Unit I The Multimedia Revolution 9 0 0

Multimedia Environment- Multimedia Data Types - Multimedia and Imaging Databases Evolution of Database Technologies - Multimedia Databases - Various Definitions of Multimedia Databases - Multimedia and Object-Oriented Databases - Other Basic Multimedia Database Management System Features - Integrating Conventional DBMSs with IR and Hierarchical Storage Systems

Unit II Object Orientation for Multimedia Databases 9 0 0

Relationship between Object Orientation and Multimedia   -   Abstract Data Types Advantages of Abstract Data typing for Multimedia Database - Inheritance - Advantages of Inheritance for Multimedia database application Development   -   Advantages of Object Identity in multimedia Database Application Development - Schema Development. Modeling, and Design for Multimedia Databases - OO Analysis and Design for Multimedia Database Applications - Development Life Cycle - Integrity Constraints for Multimedia Database Applications.

Unit III   Database Management Systems for Multimedia Databases 9 0 0

Taxonomy of Multimedia Databases -   Multimedia Objects in Relational Databases - OODatabases and Multimedia Database Applications - Integrating Object-Oriented and Database Capabilities - Extending a Database Language with OO Capabilities - Extending an Existing Object-Oriental Programming Language with Database Capabilities

Unit IV   Operations and issues with Multimedia Databases 9 0 0

Extracting Attributes and Key Features-   Objects as Attributes versus Attributes as Objects - Searching Multimedia Objects - Multikey Searching of Multimedia Objects - Spatial Databases and Data Types - Iconic Indexing - Content Searching - Content Retrieval for Text Documents - Content Retieval for Images - Indexing and Retrieval *for* Electronic video Libraries - Database Querying: Virtual-Reality Interfaces Transactions, Concurrency, and Recovery in Multimedia Databases   - Transactions   - ACID Test - Transactions for MMDBMS Applications - Transactions Involving the Three Subsystems of an MMDBMS - Concurrency Control - Recovery – Versioning

Unit V   Access Methods and Clustering for Multimedia Object Storage 9 0 0

Introducton **-** Partitioning search spaces -Indexing strategies and data structures for indexing - Single-Key Index Structures - Index structures for BLOBs positional access- Multi attribute and spatial indexing of Multimrdia objects - Indexing for Content – Retrieval- Clustering - Alternative storage strategies

Total : 45 hrs

Text Book:
   1. Setrag Khoshafian, A. Brad Baker, Multimedia and imaging databases, Morgan Kaufmann, 1996,
References:

1. Yihong Gong, Intelligent Image Databases: towards advanced image retrieval, Springer, 1998.
2. Content based Image and Video Retrieval , By Oge Marques, Borivoje Furht, Springer, 2002,

BCSE1276	**GEOGRAPHICAL INFORMATION SYTEM**	3	0	0	3

Unit I Basic Concepts   **9 0 0**
Introduction - Coordinate Systems - Vector Data Model - Raster Data Model
Unit II Data Acquistion & Manipulation   **9 0 0**
GIS Data Acquisition - Geometric Transformation - Spatial Data Editing - Attribute Data Input and Management - Data Display and Cartography
Unit III Data Analysis   **9 0 0**
Data Exploration - Vector Data Analysis - Raster Data Analysis - Terrain Mapping and Analysis - Viewsheds and Watersheds
Unit IV Interpolation & Applications   **9 0 0**
Spatial Interpolation - Geocoding and Dynamic Segmentation - Path Analysis and Network Applications
Unit V Modeling   **9 0 0**
GIS Model and Modeling

Total : 45 hrs

Text Book:
1. Kang-tsung Chang, Introduction to Geographic Information Systems, 5/e, Mcgrawhill, 2008
References:
1. Prithvish Nag And Smita Sengupta, Introduction To Geographical Information Systems, Concept Publishing Company, 2007, ISBN 8180694399, 9788180694394
2. Paul Longley, Geographical information systems, 2/e, Wiley, 1999,Digitised 2007, ISBN - 0471321826, 9780471321828

ARTIFICIAL INTELLIGENCE SPECIALISATION

BCSE1281	SOFTWARE AGENTS	3	0	0	3

Unit I   AGENTS – OVERVIEW   9 0 0

Agent Definition – Agent Programming Paradigms – Agent Vs Object – Aglet – Mobile Agents – Agent Frameworks – Agent Reasoning.

Unit II   JAVA AGENTS   9 0 0

Processes – Threads – Daemons – Components – Java Beans – ActiveX – Sockets – RPCs – Distributed Computing – Aglets Programming – Jini Architecture – Actors and Agents – Typed and proactive messages.

Unit III   MULTIAGENT SYSTEMS   9 0 0

Interaction between agents – Reactive Agents – Cognitive Agents – Interaction protocols – Agent coordination – Agent negotiation – Agent Cooperation – Agent Organization – Self-Interested agents in Electronic Commerce Applications.

Unit IV   INTELLIGENT SOFTWARE AGENTS   9 0 0

Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications.

Unit V   AGENTS AND SECURITY   9 0 0

Agent Security Issues – Mobile Agents Security – Protecting Agents against Malicious Hosts – Untrusted Agent – Black Box Security – Authentication for agents – Security issues for Aglets.

Total: 45 hrs

Text Book:
1. Richard Murch, Tony Johnson, "Intelligent Software Agents", Prentice Hall, 2000.

References:
1. Bigus & Bigus, " Constructing Intelligent agents with Java ", Wiley, 2/e 2001.
2. Bradshaw, " Software Agents ", MIT Press, 2000, Digitized in 2007
3. Russel, Norvig, "Artificial Intelligence: A Modern Approach", 2/e, Prentice Hall, 2010.
4. Gerhard Weiss, "Multi Agent Systems – A Modern Approach to Distributed Artificial Intelligence", MIT Press, 2000.

BCSE1282	KNOWLEDGE ENGINEERING	3	0	0	3

UNIT I BASICS OF KNOWLEDGE ENGINEERING   **3 0 0**

An Introduction To Knowledge Engineering - Data Information And Knowledge - Skills Of A Knowledge Engineer -An Introduction To Knowledge based Systems

UNIT II TYPES OF KNOWLEDGE BASED SYSTEMS   **9 0 0**

Expert Systems , Neural Networks , Casebased Reasoning, Genetic Algorithms, Intelligent Agents, Data Mining.

UNIT III KNOWLEDGE PROCESSING   **12 0 0**

Knowledge Acquisition , Representation and Reasoning- Using Knowledge, Logic Rules and Representation, Developing Rule based Systems, Semantic Networks, Frames, Development Environment

UNIT IV   KNOWLEDGE SYSTEMS DEVELOPMENT   **9 0 0**

Expert System Shells, Expert System Development Environments , Use of AI Languages - The Need For Methodologies, Blackboard Architectures, Problem solving Methods, Knowledge Acquisition Design System KADS, The Hybrid Methodology HYM,

UNIT V UNCERTAIN REASONING   **9 0 0**

Uncertainty and Expert Systems, Confidence Factors, Probabilistic Reasoning, Fuzzy Logic, Hybrid Knowledge Based Systems

Total: 45 Hrs

Text Book

S. Simon l. Kendal, Malcolm Creen, An Introduction To Knowledge Engineering, Springer, 2007

References:

Hojjat Adeli, Knowledge Engineering Fundamentals, McGraw-Hill, 1990, Digitized in Jan 2007

BCSE1283	PARALLEL ALGORITHMS	3	0	0	3

Unit I Parallel Random Access Machines   **9 0 0**

PRAM Model – PRAM Algorithms – Parallel Reduction – Prefix Sums – List Ranking – Preorder Tree Traversal – Merging Two Sorted Lists – Graph Coloring – Reducing Number of Processors – NC Class.

Unit II Parallel Processing Models   **9 0 0**

Classifying MIMD Algorithms – Hypercube SIMD Model – Shuffle Exchange SIMD Model – 2D Mesh SIMD Model – UMA Multiprocessor Model – Broadcase – Prefix Sums.

Unit III Parallel Sorting methods   **9 0 0**

Enumeration Sort – Lower Bound on Parallel Sorting – Odd-Even Transposition Sort – Bitonic Merge – Parallel Quick Sort – Complexity of Parallel Search – Searching on Multiprocessors.

Unit IV Parallel Search Methods   **9 0 0**

P-Depth Search – Breadth Depth Search – Breadth First Search – Connected Components – All pair Shortest Path – Single Source Shortest Path – Minimum Cost Spanning Tree.

Unit V Algorithms for Parallel Architecture   **9 0 0**

Matrix Multiplication on 2-D Mesh, Hypercube and Shuffle Exchange SIMD Models – Algorithms for Multiprocessors – Algorithms for Multicomputers – Mapping Data to Processors.
                                                                                 Total: 45 Hrs

Text Books:
1. Michael Quinn, Parallel Computing : Theory & Practice,Tata McGraw Hill Edition, 2002**.**
2. Anath Grama,Anshul Gupta, George Karpis, Vipin Kumar, Introduction to Parallel Computing, Design and analysis of Algorithms,2/e Pearson,2009

References:
1. Henri Casanova, Arnaud Legrand, Yves Robert, Parallel algorithms, CRC Press, 2009 Digitized

BCSE1284	SPEECH PROCESSING	3	0	0	3

Unit I   BASICS   9 0 0

Spoken Language System Architecture and Structure – Sound and Human Speech System – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability Theory – Estimation Theory – Significance Testing.

Unit II   SPEECH SIGNAL REPRESENTATION AND CODING   9 0 0

Short Time Fourier Analysis – Acoustic Model of Speech Production - Linear Predictive Coding – Cepstral Processing – Perceptual Motivated Representations – Formant Frequencies – Role of Pitch – Scalar Waveform Coders – Scalar Frequency Domain Coders – Code excited linear Prediction – Low – Bit rate Speech coders.

Unit III   SPEECH RECOGNITION   9 0 0

Hidden Markov Models (HMM) – Practical Issues in Using HMMs – HMM Limitations Acoustic Modeling – Phonetic Modeling – Language Modeling - Speaker Recognition Algorithms – Signal Enhancement for Mismatched Conditions.

Unit IV   SPEECH SYNTHESIS   9 0 0

Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification Of Speech – Source Filter Models For Prosody Modification – Evaluation Of Text To Speech System.

Unit V   SPOKEN LANGUAGE UNDERSTANDING   9 0 0

Dialog Structure – Semantic Representation – Sentence Interpretation – Discourse Analysis – Dialog Management – Response Generation And Rendition – Case Study.

                                                                         Total: 45 Hrs

Text Books:
1. Xuedong Huang, Alex Acero, Hsiad, Wuen Hon, " Spoken Language Processing", Prentice Hall, 2001.Digitized in 2007
2. B.Gold and N.Morgan, "Speech and Audio Signal Processing", Wiley 2/e 2011.

References:
1. Thomas F.Quatieri, "Discrete-Time Speech Signal Processing", Pearson Education, 2008.
2. M.R.Schroeder, "Computer Speech – Recognition, Compression, Synthesis", Springer Series in Information Sciences, 2004.
3. A Brief Introduction to Speech Analysis and Recognition, An Internet Tutorial - http://www.mor.itesm.mx/~omayora/Tutorial/tutorial.html
4. Daniel Jurafsky & James H.Martin, "Speech and Language Processing", PHI ,2009.

BCSE1285	SOFT COMPUTING	3	0	0	3

Unit I   Neuro – Fuzzy and Soft Computing Fuzzy Systems   9 0 0

Introduction to Fuzzy Sets – Fuzzy Rules and -   - Fuzzy Reasoning and - Inference- Fuzzy Inference Systems - Compositional Rules of Inference in Fuzzy System – Defuzzification Strategies , Fuzzy Models– System Identification – Several Least Square Methods – Optimization Techniques-Derivative-based Optimization, Derivative and Free Optimization.

Unit II   Regression and Optimization   9 0 0

System Identification – Several Least Square Methods – Optimization Techniques- Derivative-based Optimization, Derivative and Free Optimization.

Unit III   Neural Network   9 0 0

Neural Network Architecture -Network Inputs and Outputs – Feed back Inter Connections and Network Stability – Feed Forward Networks –Back Propagation Networks- Learning Methods- Adaptive Networks – Supervised Learning Neural Networks –RBFN – Unsupervised Learning Networks - Self Organizing maps, Adaptive Resonance Architectures, Radial Basis Networks- LVQM , Principle Component Anlaysis.

Unit IV   Neuro Fuzzy Modelling   9 0 0

Neural Component of a Fuzzy System – Fuzzy neural Network Controllers – Adaptive Neuro Fuzzy Inference System(ANFIS) – CANFIS – Neural Networks based Fuzzy Inference System - Classification and Regression Tests – date Clustering Techniques and Algorithms – Rule base Structure Identification

Unit V   Artificial Neural networks hardware   9 0 0

Implementation Issues – Evaluation of Neural network Architectures – Hardware Realization – VLSI approach – Optical techniques.

                                                                Total: 45 Hrs

Text Book:
1. Jyh-shing roger Jang, Chnesy-tasi sur, Eiji Miziltazui," Neuro and Soft Computing: A Computational Approach to Learning and machine Intelligence", Pearson Education 2004, Digitized in 2007

References:
1. Timothy J.rass, " Fuzzy Logic with Engineering Application", Wiley India, 2011, 3/e.
2. S.Rajasekaran , G.A.Vijayalakshmi Pai , Neural N/Ws, Fuzzy Logic and Genetic Algorithm Sysnthesis and Applications, PHI 2004

BCSE1286	MACHINE LEARNING	3	0	0	3

Unit I   BASICS   9 0 0

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

Unit II   NEURAL NETWORKS AND GENETIC ALGORITHMS   9 0 0

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evalution and Learning.

Unit III   BAYESIAN AND COMPUTATIONAL LEARNING   9 0 0

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

Unit IV   INSTANT BASED LEARNING   9 0 0

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

Unit V   ADVANCED LEARNING   9 0 0

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

Total: 45 Hrs

Text Book:
1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010

References:
1. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press 2004
2. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 2/e, 2009

HARDWARE SPECIALISATION

BCSE1291	DIGITAL SIGNAL PROCESSING	3	0	0	3

Unit I   SIGNALS & SYSTEMS   9 0 0
        Signal classifications – Signal Representation – Classification of Discrete time signals –
Typical Discrete time signals – operation on signals – Discrete time system – Classification of
Discrete time systems – solution of difference Equations.

Unit II   Z TRANSFORM & REALISATIONS   9 0 0
        Z Transform – Properties – System function – Inverse Z Transform – Realisation of
Digital filters – Direct Form-I, Direct Form-II, Transposed, parallel, cascade, Lattice- Ladder
structure.

Unit III   DFT & FFT   9 0 0
        Discrete Fourier Transform (DFT) – Definition – Properties – Convolution of sequences
– Linear convolution - circular convolution. Introduction to Radix – 2FET – Properties – DIT
(FFT) – DIF (FFT) – Algorithms of Radix – 2FFT – Computing Inverse DFT by doing a direct
DFT

Unit IV   DESIGN OF DIGITAL FILTER   9 0 0
        Review of design techniques for analog low pass filters –Frequency transformation –
Properties of IIR filter design – Characteristics of FIR filters with linear phase - Fourier series
Method – frequency sampling Method – Design of FIR filters using windows.

Unit V   EFFECTS OF FINITE REGISTER LENGTH   9 0 0
        Fixed Point & Binary floating Point Number Representation – Quantization Effects due
to truncation &Rounding – finite word length effect in digital filters.
                                                                    Total: 45 hrs

Text Books:
1. Sanjit K.Mitra 'Digital Signal Processing', A computer Based Approach, Tata McGraw
   Hill, 4/e 2011
2. B.A.Shenoi ,"Introduction to Digital Signal Processing" , 2006, John Wiley Publication

References:
1. John G.Proakis and Dimitris G.Manolakis, "Digital Signal Processing, Algorithms and
   Applications", Pearson/ PHI of India Ltd, 4/e 2007

BCSE1292	ADVANCED COMPUTER ARCHITECTURE	3	0	0	3

UNIT I   RISC ARCHITECTURE   9 0 0

Basis and Principles of RISC Design, RISC Architecture, Instruction Format , Instruction set, Addressing Modes, Efficiency of RISC CPU, Simplicity of Datapath and Control Unit Design

Unit II   Trends in Parallel processing   9 0 0

Parallelism in uni processor systems, parallel computer structures, architectural classification schemes, parallel processing applications, memory hierarchy in parallel processing systems, addressing schemes.Pipeline concept, linear pipelining and space time diagram, classification of pipeline processors, nonlinear pipeline and reservation table, interleaved memory organization, arithmetic pipelines, principles of designing pipeline processors, vector processing.

Unit III   SIMD   9 0 0

SIMD array processors, organization, masking and routing mechanisms, inter PE communications, SIMD inter connection networks, single stage and multi stage networks, mesh connected Illiac networks, parallel shifter, shuffle exchange and omega networks, parallel algorithms for array processors, matrix multiplication, polynomial evaluation, parallel sorting , fast fourier transform computation, associative array processor.

Unit IV Multiprocessor Issues   9 0 0

Multiprocessor architecture, loosely coupled and tightly coupled multiprocessor systems, processor characteristics, inter connection networks crossbar switch and multi port memories, multi stage networks, banyan and delta networks parallel memory organization, multiprocessing operating systems, classification and requirements, software requirements for MPS, language features to exploit parallelism, multi processor scheduling strategies, parallel algorithms.

Unit V Data flow & VLSI   9 0 0

Data flow computers, control flow versus data flow, data flow computer architectures, data flow graphs, data flow languages, Dennis and Irvine machines, dataflow design alternatives, dependence driven and multi level event driven approaches, VLSI computing structures, systolic array architecture, VLSI matrix arithmetic processor.

Total: 45 Hrs

Text Books:
1. Wang K. Briggs F.A "Computer Architecture and parallel processing", McGrawHill, 1984, Digitized in 2007.
2. Advance Computer Architecture and Parallel Processing ",Hesham EL- Riwini ,John Wiley and sons,2005

BCSE1293	ROBOTICS	3	0	0	3

Unit I ROBOTICS Concepts 9 0 0

Robotics and programmable automation, Historical background, Laws of Robotics , Robot definitions – Robotics system and Robot anatomy – Specifications of Robots, robot configuration, degrees of freedom, Work Volume – Precision of Movement – Safety measures in Robotics.

Unit II Robot drives, actuators and control 9 0 0

– Functions of drive systems – Hydraulic systems – Pneumatic systems – Electrical drives –Open loop and Closed loop control system- pick and place control- point to point control, continuous path control system . Robot end effectors – Classification – Drive system for grippers – Mechanical grippers – Magnetic grippers – Vacuum grippers – Adhesive grippers – Gripper force analysis and gripper design.

Unit III Sensors 9 0 0

Need for sensing systems – Sensory device – Types of sensors – Tactile sensor, Proximity Sensors, Range sensors, Navigation sensors, Vision sensors, Miscellaneous sensors, Robot vision systems – Low level vision and high level vision.

Unit IV Robot language and programming 9 0 0

Methods, Robot language – Classification of Robot languages – Computer control and robot software – VAL system and language. Application of Robots: Capabilities of Robots – Robotics applications – Obstacle avoidance.

Unit V Artificial intelligence and automated manufacturing 9 0 0

– AI and robotics Robot intelligence and task planning – State space search problem reduction – Use of predicate logic – Means and Ends analysis – Problem solving – Robot learning – Robot task planning – Basic problems in task planning.

Total: 45 hrs

Text Books:
1. Deb, "Robotics Technology and Flexible Automation", Tata McGraw,Hill, New Delhi, 2010.
2. Mikell P.Groover, "Automation Production System and Computer IntegratedManufacturing" Prentice Hall of India, New Delhi, 2008
3. Mikell P. Groover, M. Weiss, R. N. Nagal, N. G. Odrey, Industrial Robotics, McGraw Hill International, 2008.

References:
1. K. S. Fu,Ralph Gonzalez,C.S.G. Lee "Robotics : Control Sensing. Vision and Intelligence", Tata Mc Graw,Hill, New Delhi, 2008.
2. S K Saha, "Introduction to Robotics", 1/e,Tata Mc Graw,Hill, 2008

BCSE1294	MULTI CORE ARCHITECTURE AND PROGRAMMING	3	0	0	3

Unit I Introduction   9 0 0

Evolution of Computer Architecture - Trends; Fundamentals of Parallel Computers; Need for multi-core architectures

Unit II Parallel Programming   6 0 3

Overview, Parallel programming design patterns, Multithreading goals and issues, OpenMP Directives – Parallel, work sharing, task, synchronization constructs & other directives, Exercises on Multithreading with OpenMP.

Unit III Software Optimization & Performance Analysis   6 0 3

Processor Architecture basics, Need for software optimization, Algorithms analysis, Performance analysis - Hot spots, Branching, Memory, Loops.

Unit IV Benchmarking multi-core architecture   6 0 3

Bench marking of processors. Comparison of processor performance for specific application domains.

Unit V Case Studies & Lab Experiments   0 0 9

will be the content for asking questions in the SEE

Total Hours : 27+18 = 45hrs

Text Books:
1. Gerber, Aart J.C. Bik, Kevin B. Smith and Xinmin Tian, The Software Optimization Cookbook; Richard ,Intel Press, 2002
2. Shameem Akhter and Jason Roberts, Multi-Core Programming: Increasing Performance Through Software Multithreading, Intel Press, 2006

References:
1. OpenMP Spec 3.0 handbook available on the Web

BCSE1295	SPECIAL ELECTIVE – I	3	0	0	3

Any current technology trend can be framed as a syllabus and offered to students in this Special Elective

BCSE1296	SPECIAL ELECTIVE – II	3	0	0	3

Any current technology trend can be framed as a syllabus and offered to students in this Special Elective

SOCIETAL ELECTIVES

BCSE12A1	DISASTER MANAGEMENT	3	0	0	3

Unit I   Basic Concepts   3 0 0
        Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

Unit II   Disasters   12 0 0
        Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit III   Disaster Impacts   7 0 0
        Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Unit IV   Disaster Risk Reduction (DRR)   15 0 0
        Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and nonstructural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Unit V   Disasters, Environment and Development   8 0 0
        Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.- Case Studies

                                                                                    Total : 45 hrs

Text / Reference Books:
1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management ,APH Publishing Corporation.

| BCSE12A2 | **PROFESSIONAL ETHICS** | 3 | 0 | 0 | 3 |

Unit I ENGINEERING ETHICS 9 0 0

Senses of 'Engineering Ethics' - Variety of moral issues - Types of inquiry - Moral dilemmas - Moral autonomy - Kohlberg's theory -Gilligan's theory - Consensus and controversy - Professions and professionalism – Professional ideals and virtues - Theories about right action - Self-interest-Customs and religion - Uses of ethical theories

Unit II ENVIRONMENTAL ETHICS 9 0 0

Environmental Preservation – Role of stakeholders – International issues – Sustainable Development – Industrial pollution – Environment Requtation – Environment performance – Engineering Management in India – Pollution control charts.

Unit III RESPONSIBILITIES AND RIGHTS 9 0 0

Collegiality and loyalty - Respect for authority - Collective bargaining - Confidentiality – Conflicts of interest - Occupational crime - Professional rights - Employee rights – Intellectual Property Rights (IPR)-Discrimination.

Unit IV GLOBAL ISSUES 9 0 0

Multinational corporations - Environmental ethics-Computer ethics-Weapons development-Engineers as managers-Consulting engineers-Engineers as expert witnesses and advisors-Moral leadership-Sample codes of conduct- Case study's with reference to Indian scenario.

Unit V ETHICS In IT INDUSTRY 9 0 0

Structure of IT – ITES industry, Unique characteristics, Ethical perspective, Case studies – Credit Card Fraud, Cyber crime.

Total : 45 hrs

Text Books:
1. Mike Martin and Roland Schinzinger, "Introduction to Engineering Ethics", McGraw Hill, 2009.
2. A.C. Fernando, "Business Ethics : An Indian Perspective", pearson 2009 (II – V)

References:
1. Charles D.Fleddermann, "Engineering Ethics", prentice Hall, 2011, 4/e.
2. David Ermanu and Michale S Shauf, "Computers, Ethics and Society", Oxford University, Press, 2003, 3/e.

BCSE12A3	ECONOMICS FOR ENGINEERS	3	0	0	3

Unit - I   **Basic Principles and Methodology of Economics**   **12**

Demand/Supply – elasticity – Theory of the Firm and Market Structure, Basic Macro-economic Concepts and Identities for both closed and open economies, Aggregate demand and Supply (IS/LM),Price Indices(WPI/CPI), Interest rates, Direct and Indirect Taxes

Unit - II   **Public Sector Economics**   **11**

Welfare, Externalities, Labour Market,Components of Monetary and Financial System, Central Bank ,Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy ,Inflation and Phillips Curve.

Unit - III   **Elements of Business Economics**   **6**

Cost &Cost Control –Techniques, Types of Costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming,

Unit - IV   **Investment Analysis**   **6**

NPV, ROI, IRR, Payback Period, Depreciation, Time value of money, Business Forecasting, Elementary techniques Statements ,Cash flow, Financial..

Unit V   **Indian economy**   **10**

Post independence period - reform Growth, Structure of productive activity, Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization,Employment–Informal, Organized, Unorganized,Public, Private Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.

Total Hrs : 45

Text / Reference Books:

1. Mankiw Gregory N.(2002), *Principles of Economics,* Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), *Managerial Economics,* Tata McGraw Hill
3. Misra, S.K. and Puri (2009), *Indian Economy,* Himalaya
4. Pareek Saroj (2003), *Textbook of Business Economics,* Sunrise Publishers

BCSE12A4	SOCIAL COMPUTING (WEB 2.0)	3	0	0	3

Unit I **Basic Concepts** **9 0 0**

Web 2.0 Introduction – Advantages & Disadvantages of Web2.0 – Business Aspects of Web2.0 – Web2.0 Principles – Characteristics – design aspects – Introduction to Web services.

Unit II **WEB2.0 SERVICES** **9 0 0**

Web2.0 Services – Applications –Communication -   Blogs – Topic, Event, Marketing, Learning , Scholarly - Wiki – Wikia,Wetpaint,Pbwiki,Wikispaces -Podcasting , Vodcasting - 21st century skills - Social Networking- Social Bookmarking – RSS & Syndication –Newer Web2.0 services and Applications.

Unit III **TECHNOLOGY** **9 0 0**

Ajax – Alternatives to Ajax – Open APIs –SOAP –REST - Microformats – Client side technologies – Web gateway - Security Challenges with Web2.0 – Content Management System(CMS)

UNIT IV **APPLICATION CREATION** **9 0 0**

DOJO toolkit - Creation of Application with DOJO, JSON ,Adobe Flex, Cloud computing, Hadoop – Building Offline Applications using Adobe AIR.

UNIT V **CASE STUDIES** **9 0 0**

Teaching & Learning Issues – Research – Academic Publishing –Library –Repositories – Archiving – Future of Web2.0 – Web2.0 & Semantic Web –Emergence of Web Science.

Total: 45 Hrs

References:

1. "Web2.0- concepts & Applications", shelly / Frydenberg, 2011, Cengage Learning.
2. "Web 2.0 – new tools, new schools" , Gwen Solomon, Lynne Schrum, 2007, ISTE Publication.
3. www.jisc.ac.uk - JISC Technology and Standards Watch, Feb. 2007 Web 2.0(PDF)
4. Web2.0 Tutorials(from web)
5. Mastering Web2.0 Technologies(from web)
6. www.dojotoolkit.org

BCSE12A5	GLOBAL STRATEGY AND TECHNOLOGY	3	0	0	3

Unit I　　　　Introduction to Global Strategy　　　　　　　　　　　9 0 0

Motivations to Global Strategy ,demands of global integration, local responsiveness and worldwide learning, global MNCs , Internationalization of Corporate Capitalism

Unit II　　　　Location and Global Strategy　　　　　　　　　　　9 0 0

Home-Country Effects**:** global leadership in the watch industry,decline of the Swiss watch industry, Distance and Global Strategy, Host Country Choices: The Globalization of CEMEX , benefits , Challenges, advantages, Industry Characteristics and Global Strategy, Design of a competitive strategy, Haier's current global strategy ,Good rationale for Haier.

Unit III　　　　International Corporate Governance　　　　　　　　9 0 0

Corporate Governance with Chinese Characteristics, China′s capital market, Corporate

governance model in China, model Conditions for Petro China′s corporate governance system Cross-

cultural Negotiation: MOUSE negotiation Issues, negotiation outcome Issues, Negotiators attitudes and culture , role of information acquisition in negotiation, Foreign Market Entry Strategies: Issues in geographic market diversification,different strategies of internationalization, different entry modes into a foreign market,Stages of internationalization,International operations,Tensions of an enterprise going international.

Unit IV　　　　Technology: Productivity and Diffusion　　　　　　9 0 0

Productivity Impact and Managing Diffusion Science, Technology and Productivity, Technology, Markets and Competition Incumbents and Entrants Commercialization Intellectual Property and Complementary Assets.

Unit V　　　　Investing in R&D Capabilities　　　　　　　　　　9 0 0

Incentives to Innovate Investing in basic/applied research, Real options and other approaches, Applying the Concepts and Frameworks, R&D Investment Decisions, Applying the NPV, Real Options and Scenario,Planning Frameworks.

Total　　: 45 hrs

References

1. Pankaj Ghemawat, Redifing Global Strategy, Harvard business School Press, 2007.
2. A.Larker and B.Tayan, Corporate Governance Matters , FT Press, 2011.
3. Noel Capon, James M. Hulbert, **Managing Marketing in the Twenty-first Century,** Wessex Publishing, 2007
4. Sumantra Ghoshal, Gita Piramal, Christopher A. Bartlett, **Managing Radical Change, 2/e,** Penguin Books India, 2002
5. Nancy J. Adler, Allison Gundersen, International Dimensions of Organizational Behavior, 5/e, Cengage Learning, 2008.

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BCSE12A6	HUMAN VALUES AND HUMAN RIGHTS	3	0	0	3

UNIT I   VALUE EDUCATION   9 0 0
Values and Self Development-Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

UNIT II SELF DEVELOPMENT & PERSONALITY DEVELOPMENT   9 0 0
Self Leadership & Self Managemnt -3P's – Perseverance – Personality Theories – Stages of Personality Development – Emotional Stress – Handling of Conflicts – Personality for Face value –Positive attitude – Aware of self destructive habits, Association and cooperation,.

UNIT III BEHAVIOR DEVELOPMENT   9 0 0
Meaning of Professionalism – Guiding Ethics – Developmental Framework –Professional Behaviors: Dependability, Initiative ,Empathy, Clinical Reasoning, Verbal & Write Communication, Developing Professionalism in the next generation.

UNIT IV HUMAN RIGHTS   9 0 0
The United Nations - The International Bill of Human Rights - Regional protection of human rights- Europe - American States- The right to liberty of person - Equality before the law - the right to a fair trial - The right to selfdetermination - Freedom of expression - The right to work - The right to education and human rights education - Equality and nondiscrimination - The right to life

UNIT V CONSTITUTION OF INDIA   9 0 0
Framing of Constitution –Features of Constitution – Federal System – Formation of States – Citizenship – Fundamental Rights – Fundamental Duties – Union Legislature – State Legislature – Judiciary – Courts – Public Service Commission – Elections – Amendments of the Constitutions – Natural Justice.

Total : 45Hrs

Reference Books:
1. R.S. Naagarazan, Textbook on Professional Ethics and Human Values, New Age International, 2007 (Unit 1)
2. "Personality Development ", R.C.Bhatia, Ane Books Pvt Ltd, 2010 (unit 2)
3. "Developing Professional Behaviors", Jack Kasar, E.Nelson Clark, Slack Incorporated Copyright, 2000. (Unit 3)
4. Rhona K. M. Smith, Textbook on International Human Rights, 3/e, Oxford Univ Press, 2007.(Unit 4)
5. "Introduction to Constitution of India" , Brij Krishore Sharma, 4/e ,PHI , 2007.(Unit 5)