

BACHELOR OF TECHNOLOGY (IGDTUW)
Computer Science and Engineering

Scheme of Examination for 2nd, 3rd & 4th Year
&
Syllabus for 2nd Year

BACHELOR OF TECHNOLOGY (IGDTUW)
Computer Science and Engineering

THIRD SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 201	Discrete Mathematics	4	-	4	DC
2	BIT 203	Database Management Systems	4	-	4	DC
3	BCS 207	Data Structure	4	-	4	DC
4	BIT 209	Object Oriented Programming	4	-	4	DC
5	BEC 211	Analog & Digital Electronics	4	-	4	ES
PRACTICAL/VIVA VOCE						
1	BIT 253	Database Management Systems Lab	0	2	1	DC
2	BCS 257	Data Structure Lab	0	4	2	DC
3	BIT 259	Object Oriented Programming using C++ and JAVA Lab	0	2	1	DC
4	BEC 261	Analog & Digital Electronics Lab	0	2	1	ES
TOTAL			20	10	25	

FOURTH SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BAS 202	Advance Engineering Mathematics	4	-	4	ES
2	BCS 204	Computer Organization & Architecture	4	-	4	DC
3	BCS 206	Analysis & Design of Algorithms	4	-	4	DC
4	BIT 208	Operating System	4	-	4	DC
5	BIT 210	Object Oriented Software Engineering	4	-	4	DC
PRACTICAL/VIVA VOCE						
1	BCS 254	Computer Organization & Architecture Lab	0	2	1	DC
2	BCS 256	Analysis & Design of Algorithms Lab	0	4	2	DC
3	BIT 258	Operating System Lab (using LINUX as Case Study)	0	2	1	DC
4	BIT 260	Object Oriented Software Engineering Lab	0	2	1	DC
TOTAL			20	10	25	

FIFTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 301	Theory of Computation	4	-	4	DC
2	BIT 303	Computer Graphics & Multimedia	4	-	4	DC
3	BCS 305	Microprocessor & Microcontroller	4	-	4	DC
4	BIT 307	Data Communication & Computer Networks	4	-	4	DC
5	BIT 309	Data Warehousing & Data Mining	4	-	4	DC
6	BAS 311	Human Values & Professional Ethics	3	-	3	HS
PRACTICAL/VIVA VOCE						
1	BIT 353	Computer Graphics & Multimedia Lab	0	4	2	DC
2	BCS 355	Microprocessor & Microcontroller Lab	0	2	1	DC
3	BIT 357	Data Communication & Computer Networks Lab	0	2	1	DC
4	BIT 359	Data Warehousing & Data Mining Lab	0	2	1	DC
TOTAL			23	10	28	

SIXTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 302	Mobile Architecture & Programming	4	-	4	DC
2	BCS 304	Compiler Design	4	-	4	DC
3	BCS 306	Network Programming	4	-	4	DC
4	BCS 308	Cloud Computing	4	-	4	DC
5	BIT 310	Artificial Intelligence	4	-	4	DC
6	BAS 312	Engineering Economics	3	-	3	HS
PRACTICAL/VIVA VOCE						
1	BCS 352	Mobile Architecture & Programming Lab	0	2	1	DC
2	BCS 354	Compiler Design Lab	0	2	1	DC
3	BCS 356	Network Programming Lab	0	2	1	DC
4	BCS 358	Cloud Computing Lab	0	2	1	DC
5	BIT 360	Artificial Intelligence Lab	0	2	1	DC
TOTAL			23	10	28	

NOTE: 4-6 weeks training will be held after sixth semester. However, Viva-Voce will be conducted in the seventh semester.

SEVENTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 401	Advance Computer Architecture	4	-	4	DC
2	BCS 403	Mobile Computing	4	-	4	DC
ELECTIVES-I (Choose Any One)						
1	BIT 401	Software Testing	4	-	4	DE
2	BEC 401	Wireless Communication				
3	BIT 403	Big Data Analytics				
4	BCS 407	**Emerging trends in Computer Science Engineering				
5	BCS 409	Soft Computing				
6	BIT 413	**Internet Technologies				
ELECTIVES-II (Choose Any One)						
1	BMA 419	Process Improvement Techniques	3	-	3	HS
2	BMA 421	Financial Accounting				
PRACTICAL/VIVA VOCE						
1	BCS 451	Advance Computer Architecture Lab	0	2	1	DC
2	BCS 453	Mobile Computing lab	0	2	1	DC
3	BCS 455	Practical based on Electives – I	0	2	1	DE
4	BCS 457	*Minor Project	0	8	5	DC
5	BCS 459	Practical Training	-	-	2	DC
TOTAL			15	14	25	

*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

** Any of these subjects may be chosen in E-Learning mode and supervised by Internal Faculty-in-Charge.

EIGHTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 402	Embedded Systems & Design	4	-	4	DC
2	BIT 404	Network Security Management	4	-	4	DC
ELECTIVES-I (Choose any one)						
1	BCS 406	Real Time Systems	4	-	4	DE
2	BIT 408	Natural Language Processing				
3	BCS 410	Advanced Database Management Systems				
4	BCS 412	**Wireless Sensor Networks				
5	BIT 414	IPR & Cyber Laws				
ELECTIVES-II (Choose any one)						
1	BMA 420	Business Entrepreneurship	3	-	3	HS
2	BMA 422	Organizational Behavior				
PRACTICAL/VIVA VOCE						
1	BCS 452	Embedded Systems & Design Lab	0	2	1	DC
2	BIT 454	Network Security Management lab	0	2	1	DC
3	BCS 456	*Major Project	0	12	8	DC
TOTAL			15	16	25	
GRAND TOTAL					212	

*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

** Any of these subjects may be chosen in E-Learning mode and Supervised by Internal Faculty-in-Charge.

NOTE: 1. Total number of the credits of the B.Tech. Programme = 212

2. Each student shall be required to appear for examinations in all courses. However, for the award of the degree a student shall be required to earn the minimum of 204 credits without excluding core exams.

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Proofs of some general identities on sets. **Relations:** Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. **Functions:** Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions. **Natural Numbers:** Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases, Proof Methods, Proof by counter – example, Proof by contradiction.

[10 Hrs]

Unit-II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n. **Partial order sets:** Definition, Partial order sets, Combination of partial order sets, Hasse diagram. **Lattices:** Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

[10 Hrs]

Unit-III

Binary Logic : Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. **Predicate Logic:** First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic. **Multivalued Logic:** Fuzzy Logic, Introduction to fuzzy sets, Operations on fuzzy sets.

[10 Hrs]

Unit-IV

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree. **Graphs:** Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. **Recurrence Relation & Generating function:** Recursive definition of functions, Recursive algorithms, Method of solving recurrences. **Combinatorics:** Introduction, Counting Techniques, Pigeonhole Principle, Countability, Dovetailing.

[10 Hrs]

TEXT BOOKS:

1. Kenneth H. Rosen, “Discrete Mathematics and Its Applications”, 6/e, McGraw-Hill, 2006.
2. B. Kolman, R.C. Busby, and S.C. Ross, “Discrete Mathematical Structures”, 5/e, Prentice Hall, 2004.
3. C.L. Liu, “Elements of Discrete Mathematics”, TMH, 2000.

REFERENCE BOOKS:

1. Koshy, “Discrete Structures”, Elsevier Pub. 2008.
2. E.R. Scheinerman, “Mathematics: A Discrete Introduction”, Brooks/Cole, 2000.
3. R.P. Grimaldi, “Discrete and Combinatorial Mathematics”, 5/e, Addison Wesley, 2004.

4. Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw-Hill, Inc. New York, NY, 1975.
5. John Yen & Reza Langari, "Fuzzy logic intelligence control and information", Prentice Hall, 1999.

Paper Code: BIT 203

Paper Title: Database Management Systems

L	P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS:

Max. Marks: 60

- 1 **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT-I

Overview of Concepts and Conceptual Database Design: Database administrator & Database Users, Characteristics of the Database, Database Systems, Concepts and Architecture, Data Models, Schemes & Instances, DBMS Architecture & Data Independence, Database Languages & Interfaces, Overview of Hierarchical, Network & Relational Data Base Management Systems, Data Modelling Using The Entity-Relationship Model – Entities, Attributes and Relationships, Cardinality of Relationships, Strong and Weak Entity Sets, Generalization, Specialization, and Aggregation. **[10 Hrs]**

UNIT-II

Relational Model, Languages & Systems: Relational Model Concepts, Relational Model Constraints, Translating your ER Model into Relational Model, Relational Algebra, Relational Calculus (tuple calculus)
SQL – A Relational Database Language, Data Definition in SQL, View and Queries in SQL, Specifying Constraints and Indexes in SQL, Practicing SQL commands using ORACLE **[10 Hrs]**

UNIT-III

Relational Data Base Design: Functional Dependencies & Normalization for Relational Databases, Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF, 5NF), Lossless Join and Dependency Preserving Decomposition, Multivalued Dependency, Join dependency. **Transaction Management:** Transaction Concept and State, Implementation of Atomicity and Durability, Serializability, Recoverability, Implementation of Isolation **[10 Hrs]**

UNIT-IV

Concurrency Control: Lock-Based Protocols, Timestamp-based Protocols, Deadlock Handling, Recovery System, Failure Classification, Storage Structure, Recovery and Atomicity, Log-based Recovery. **Query Processing:** Query Processing Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions. **Framework of Distributed Data Base Management Systems, Introduction to Enhanced Databases:** Multimedia Databases, Object Oriented Databases, Mobile Databases and Case study on various commercially available DBMS. **[10 Hrs]**

TEXT BOOKS:

1. Korth, Silberschatz, “Database System Concepts”, 6th Ed., TMH, 2010.
2. Elmsari and Navathe, “Fundamentals of Database Systems”, 6th Edition, Pearson, 2013.
3. C. J. Date and Kannan, “An Introduction to Database Systems”, 8th Ed., Pearson, 2006.

REFERENCE BOOKS:

1. Ceri and Pelagatti, “Distributed Databases : principles & Systems”, Mcgraw-Hill Computer Science Series, 2008.
2. J. D. Ullman, “Principles of Database Systems”, 2nd Ed., Galgotia Publications, 1999.
3. Conolly & Begg, “ Database Management Systems, 5th Edition, Pearson Education Asia, 2010.

Code No.: BCS 207	L	P	C
Paper: Data Structure	4	0	4

INSTRUCTIONS TO PAPER SETTERS:**Max. Marks: 60**

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks

UNIT-I

Fundamentals of algorithm analysis: Time and space complexity, Elementary data structures and their applications. **Arrays:** ordered lists, representation of arrays, sparse matrices. **Linked List:** singly and doubly linked lists, Circular Linked list **Stacks:** Primitive operations, Application of stacks, multiple stacks. **Queue:** Primitive operations, Application of queues, multiple queues. **[10 Hrs]**

UNIT-II

Recursion: Recursive definition and processes, Factorial function, Fibonacci series, Recursive binary search. **Trees:** Binary Trees; Definition, traversal, threaded binary Tree. **Graphs:** Representation, traversal, connected components, shortest path algorithms, topological sort, Minimum Spanning Tree; Definitions and algorithms. **[10 Hrs]**

UNIT-III

Searching: Sequential Search, Binary Search, Tree Searching, Binary Search Tree, Insertion & Deletion, AVL trees, Multi way search tree, B tree, B⁺ Tree. **Hashing:** Hash Function, Hash Table, Hashing Techniques. **[10 Hrs]**

UNIT-IV

Sorting: Quick Sort, Merge Sort, Heap Sort and other sorting techniques, K-way Merge Sort. **Files:** Creation and Processing of files, File handling, Reading/ Writing of files, Operations of

files, File Organization, Indexing, Error handling. **Storage Management:** Automatic List Management, Reference Count Method, Garbage Collection, Collection and Compaction.

[10 Hrs]

TEXT BOOKS:

1. Y. Langsam et. al., "Data Structures using C and C++", PHI, 1999.
2. R. L. Kruse, B. P. Leung, C. L. Tondo, "Data Structures and program design in C", PHI, 2000.

REFERENCES BOOKS:

1. Schaum's outline series, "Data Structure", TMH, 2002
2. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Booksource Pvt. Ltd, 1999.
3. Yashwant Kanetkar, "Data Structure through C", BPB, 2005

Paper Code: BIT 209

Paper Title: Object Oriented Programming

L	P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS:

Max. Marks: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks

UNIT-I

Introduction: Need for Object Oriented Programming, Comparison of Programming paradigms, Characteristics of Object-Oriented Programming Languages, Introduction to Object Oriented concepts (classes, objects, encapsulation, inheritance, data hiding, abstraction, polymorphism), Overview and characteristics of C++ , Fundamentals Data Types & Literals Variables, Arrays, Operators, Control of Flow in OOP, Compilation and Execution Process in C++, Reference vs. Pointer variable. **Classes and Objects:** C++ & Java class declaration, Role of private, public and protected access specifiers, Memory organization of class, inline function, friend function, static members , constructor and destructors, instantiation of objects, default parameter value, object types, C++ garbage collection, dynamic memory allocation, new and delete operator

[10 Hrs]

UNIT-II

Polymorphism in C++: Function overloading, Constructor overloading, Compile time polymorphism, Overloading Rules, Operator Overloading (Unary and Binary) as member function/friend function. **Inheritance in C++:** Inheritance, Types of Inheritance, Use of protected access specifier, Virtual base class, Ambiguity resolution using scope resolution operator and Virtual base class, Overriding inheritance methods, Constructors and Destructor in derived classes. Runtime polymorphism, Pointer to objects, Virtual Functions (concept of virtual table), pure virtual functions, Abstract Class.

[10 Hrs]

UNIT-III

Managing Input / Output in C++: Concept of streams, console I/O – formatted and unformatted, Manipulators, File I/O – Predefined classes, file opening & closing, file manipulation, read & write operations, sequential and random file access. **Exception Handling in C++:** Basic mechanism, Throwing, Catching and Re-throwing. **Namespace:** Basic concept, role of scope resolution operator and using keyword.

[10Hrs]

UNIT-IV

Introduction to Java- Overview and characteristics of Java, Data types, Organization of the Java Virtual Machine, Compilation and Execution Process in java, Classes: String and String Buffer classes, Wrapper classes, using super keyword, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Exception Handling: Fundamentals exception types, uncaught exceptions, throw, throws, final, built in exception, creating your own exceptions, **Multithreaded Programming:** Fundamentals, Java thread model: priorities, synchronization, thread classes, Runnable interface, inter thread Communication, suspending, resuming and stopping threads.

[10Hrs]

TEXT BOOKS:

1. E. Balaguruswamy, “Object Oriented Programming with C++”, 4th Edition, TMH, 2011.
2. Bjarne Stroustrup , “The C++ Programming Language”, Addison Welsley, 3rd Ed, 2000.
3. Patrick Naughton and Herbertz Schildt , “Java-2: The Complete Reference”, TMH, 1999.

REFERENCE BOOKS:

1. Schildt Herbert, “C++: The Complete Reference”, Tata McGraw Hill, 4th Ed., 1999.
2. R. Nageswara Rao/kogent Solutions,” Core Java: An Integrated Approach: Covers Concepts, programs and Interview Questions”, 2008.
3. Pandey, “JAVA Programming”, Pearson, 2012.

Paper Code: BCS 204

L P C

Paper Title: Computer Organization and Architecture

4 0 4

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks : 60

- 1 **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.**

UNIT-I

Basic functional blocks of a computer and its Representation: Functional units, Basic operational concepts, Bus structures, Performance and metrics, Instructions and instruction sequencing, Hardware–Software Interface, Instruction set architecture, Addressing modes, RISC, CISC, ALU design, Fixed point and floating point operations, Case study of a CPU (Intel Atom Board). **[10 Hrs.]**

UNIT-II

CPU Control Unit Design: Execution of a complete instruction, Multiple bus organization, Hardwired control, Micro programmed control, Computer arithmetic, Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication - shift-and-add, Booth multiplier, carry savemultiplier etc. **Pipeline-** Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Performance considerations, Exception handling. Case Study of Intel Atom Board. **[10 Hrs.]**

UNIT-III

Memory system design: Basic concepts, Semiconductor RAM – ROM, Speed, Size and cost, Cache memories, Improving cache performance, Virtual memory, Memory management requirements, Associative memories, Secondary storage devices. Case study of Intel Atom Board. **[10 Hrs.]**

UNIT-IV

I/O Organization: Accessing I/O devices, Programmed Input/Output, Interrupts, Direct Memory Access, Buses, Interface circuits, Standard I/O Interfaces (PCI, SCSI, USB), I/O devices and processors. **[10 Hrs.]**

TEXT BOOKS:

1. John P. Hayes, “Computer Architecture and Organization”, McGraw-Hill, 1998.
2. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Pearson Education, 2010.
3. M.Morris Mano, “Computer System Architecture”, PHI, 2nd Edition.

REFERENCE BOOKS:

1. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Elsevier, 2012.
2. Carl Hamachar, Zvonco Vranesic and Safwat Zaky, “Computer Organization”, McGraw Hill, 1990.
3. Vincent P. Heuring and Harry F. Jordan, “Computer Systems Design and Architecture”, Pearson Education, 2nd Edition, 1996.

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks : 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

UNIT-I

Preliminaries: Review of growth of function, Recurrences: Substitution method, Iteration method, Master method. **Divide and Conquer Approach:** Merge Sort, Quick sort, Simultaneous Max and Min Problem, Strassen's algorithm for Matrix Multiplications. [10 Hrs.]

UNIT-II

Greedy Algorithms: Elements of Greedy strategy, knapsack problem, job sequencing with deadlines, minimum spanning trees, Activity selection problem, Huffman Codes. **Dynamic Programming:** Elements of Dynamic Programming, Matrix Chain Multiplication, Longest common subsequence and optimal binary search trees problems. [10 Hrs.]

UNIT-III

Graph Algorithms: DFS, BFS, Topological Sort, Strongly Connected Components, Kruskal's and Prim's algorithm for MST, Dijkstra's and Bellman Fort Algorithm, All pair shortest paths Algorithm. **Back Tracking:** General method, 8 queen's problem, **Branch and Bound:** General Method, 0/1 knapsack. [10 Hrs.]

UNIT-IV

String matching: Naïve String Matching algorithm, Rabin-Karp Algorithm, String Matching with finite automata, The Knuth-Morris Pratt algorithm. **NP-Complete Problem:** Polynomial-time verification, NP-Completeness and Reducibility, NP-Completeness Proof, NP-Complete problems. [10 Hrs.]

TEXT BOOKS:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein, "Introduction to Algorithms", 2nd Ed., PHI, 2004.
2. Ellis Horowitz and Sartaz Sahani, "Fundamental of Computer Algorithms", Galgotia Publications, 1999.

REFERENCES BOOKS:

1. A. V. Aho, J. E. Hopcroft, J. D. Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley, 1998.
2. D. E. Knuth, "The Art of Computer Programming", 2nd Ed., Addison Wesley, 1998
3. Jean Paul Trembley, Richard B. Bunt, "Introduction to Computers Science- An algorithms approach", T.M.H, 2002.

Paper Code: BIT 208
Paper Title: Operating System

L	P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS:

Max. Marks: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT-I

Introduction: What is an Operating System, **Types of O.S:** Simple Batch, Multi-programmed Batched, Time-Sharing, Personal-computer, Parallel, Distributed, Real-Time, Mobile

Operating-System Structures: Layered Architecture, System Calls, System Programs, System Structure, Virtual Machine

Processes: Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Inter-process Communication, Threads, Multithreaded Programming. **CPU**

Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling

[10 Hrs]

UNIT-II

Process Synchronization: Background, Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Atomic Transactions. **Memory Management:** Background, Logical versus Physical Address space, Swapping, Contiguous allocation, Fragmentation, Paging, Segmentation, Segmentation with Paging. **Virtual Memory:** Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing. **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

[10 Hrs]

UNIT-III

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices. **Secondary-Storage Structure:** Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable-Storage Implementation. **Information Management:** Introduction, Simple File System, General Model of a File System, Symbolic File System, Basic File System, Access Control Verification, Logical File System, Physical File System.

[10 Hrs]

UNIT-IV

File-System Interface: File Concept, Access Methods, Directory Structure, Protection, Consistency Semantics File-System Implementation: File-System Structure, Allocation Methods, Free-Space Management, Directory Implementation, Efficiency and Performance, Recovery.

[10 Hrs]

Note: Case Study of Linux & Windows along with O.S concepts to be taught.

TEXT BOOKS:

1. Silberschatz and Galvin, "Operating System Concepts", Pearson, 8th Ed., 2008.
2. Dr. R. C. Joshi, "Operating Systems", Wiley Dreamtech, 2005.

REFERENCES BOOKS:

1. Tannenbaum, "Operating Systems", PHI, 4th Edition, 2006.
2. E. Madnick, J. Donovan, "Operating Systems", Tata McGraw Hill, 2001.

Paper Code: BIT 210

Paper Title: Object Oriented Software Engineering

L	P	C
4	0	4

INSTRUCTIONS TO PAPER SETTERS:

Max. Marks: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks

UNIT-I

Introduction: Software Crisis, Software Processes, **Software Process Life cycle models:** Waterfall Model, Prototyping Model, Iterative Enhancement Model, Evolutionary Development and Spiral Model. **Object Oriented Methodology:** Object Oriented Concepts, Object Oriented Process and Models

[10 Hrs]

UNIT-II

Software Requirements Analysis & Specifications: Requirement Elicitation Concepts, Managing Requirements Elicitation, Software Requirement Specification (SRS) Standards.

Analysis and Modeling: Analysis concepts, Data Flow Diagrams, Analysis Activities, Unified Modeling Language (Use cases, Class Diagram, Interaction diagrams, Activity diagram, object models) Modeling Interactions among Objects.

[10 Hrs]

UNIT-III

Software System Design: Design standards, design issues: cohesion and coupling, object oriented design, Detailed class diagram, Reuse Concepts-Solution Objects, Inheritance and Design Patterns, Reuse Activities- Selecting Design Patterns and Components, Managing Reuse

Software Project Planning: Function Point Model, Cost estimation, COCOMO model, Putnam Resource Allocation Model **Software metrics:** Function Count, Data Structure Metrics, Information Flow Metric, and Object oriented metrics.

[10 Hrs]

UNIT-IV

Software Testing: Introduction to Functional testing and Structural Testing, Unit testing, integration and system testing, Testing Tools & Standards. **Software Maintenance:** Management of Maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

[10 Hrs]

TEXT BOOKS:

1. Bruegge and Dutoit, "Object-Oriented Software Engineering- Using UML, Patterns and Java", 3rd Edition, 2010
2. R. S. Pressman, "Software Engineering – A practitioner's approach", 7th ed., McGraw Hill Int. Ed., 2010.
3. K.K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International, 3rd Edition, 2007
4. G. Booch, J Rumbaugh, I Jacobson, "The Unified Modeling Language User Guide" 11th Ed., Pearson Education, 2003.

REFERENCES BOOKS:

1. Timothy C. Lethbridge, Robert Laganier "Object oriented Software Engineering: Practical Software development using UML and Java" 2nd Ed. McGraw Hill, 2005
2. Jacobson, "Object-Oriented Software Engineering: A Use Case Driven Approach", Pearson, 1992

BACHELOR OF TECHNOLOGY (IGDTUW)
Computer Science and Engineering
(Teaching and Examination Scheme) – Proposed

FIFTH SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 301	Theory of Computation	4	-	4	DC
2	BIT 303	Computer Graphics & Multimedia	4	-	4	DC
3	BCS 305	Microprocessor & Microcontroller	4	-	4	DC
4	BIT 307	Data Communication & Computer Networks	4	-	4	DC
5	BIT 309	Data Warehousing & Data Mining	4	-	4	DC
6	BAS 311	Human Values & Professional Ethics	3	-	3	HS
PRACTICAL/VIVA VOCE						
1	BIT 353	Computer Graphics & Multimedia Lab	0	4	2	DC
2	BCS 355	Microprocessor & Microcontroller Lab	0	2	1	DC
3	BIT 357	Data Communication & Computer Networks Lab	0	2	1	DC
4	BIT 359	Data Warehousing & Data Mining Lab	0	2	1	DC
TOTAL			23	10	28	

SIXTH SEMESTER

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 302	Mobile Architecture & Programming	4	-	4	DC
2	BCS 304	Compiler Design	4	-	4	DC
3	BCS 306	Network Programming	4	-	4	DC
4	BCS 308	Cloud Computing	4	-	4	DC
5	BIT 310	Artificial Intelligence	4	-	4	DC
6	BAS 312	Engineering Economics	3	-	3	HS
PRACTICAL/VIVA VOCE						
1	BCS 352	Mobile Architecture & Programming Lab	0	2	1	DC
2	BCS 354	Compiler Design Lab	0	2	1	DC
3	BCS 356	Network Programming Lab	0	2	1	DC
4	BCS 358	Cloud Computing Lab	0	2	1	DC
5	BIT 360	Artificial Intelligence Lab	0	2	1	DC
TOTAL			23	10	28	

NOTE: 4-6 weeks training will be held after sixth semester. However, Viva-Voce will be conducted in the seventh semester.

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

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- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.

Unit-I

Introduction: Alphabets, Strings and Languages, Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, **Simplified notation:** State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem. [10 Hrs]

Unit-II

Regular expression (RE): Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, **FA with output:** Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA. [10 Hrs]

Unit-III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, **Normal forms for CFGs:** CNF and GNF, Closure properties of CFLs, **Decision Properties of CFL's:** Emptiness, Finiteness and Membership, Pumping lemma for CFL.

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

[10 Hrs]

Unit-IV

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs, Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory. [10 Hrs]

TEXT BOOKS:

1. Peter Linz, “An Introduction to Formal Language and Automata”, 4th edition.2010.
2. Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education. Second Edition, Copyright © Year 2001.

REFERENCE BOOKS:

1. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI., 3rd Edition Year 2008.
2. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH Forth Edition, Year 2011.
3. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI, 2nd Edition, Year 2008

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UNIT-I

Introduction and Overview of Graphics Systems: Use of Computer graphics, Introduction to CRT and TFT Displays, Raster and Random Scan Displays, Flat Panel Displays, TFT Displays.

Scan Conversion Algorithms: Scan Converting Lines (DDA, Bresenham), Scan Converting Circles (Mid-point, Bresenham), Scan Converting Ellipses (Midpoint). **Clipping:** Two-Dimensional Clipping, Cohen-Sutherland Subdivision Line Clipping Algorithm.

2D-Transformation: Representation of Points, Transformations and Matrix, Transformation of Straight Line, 2D Rotation, Reflection, Scaling, Combined Transformations, Translation and Homogeneous Coordinates, Translation, Rotation about an Arbitrary Point, Reflection through an Arbitrary Line, window-to-viewport transformation. **[10Hrs]**

UNIT-II

3D-Transformation: Representation of Points, 3D Scaling, 3D Shearing, 3D Rotation, Three Dimensional Translation, 3D Reflection, Multiple Transformations, Rotation about an Axis Parallel to a Coordinate Axis, Rotation about an Arbitrary Axis in Space.

The Dimensional Perspective Geometry: Geometric Projection, Orthographic Projections, Oblique Projections, Perspective Transformations, Single-Point Perspective Transformation, Two-Point Perspective Transformation, Three-Point Perspective Transformation.

Solid Modeling: Representing Solids, Regularized Boolean Set Operation primitive Instancing, Sweep Representations, Boundary Representations, Spatial Partitioning Representations, Constructive Solid Geometry, Comparison of Representations. **[10Hrs]**

UNIT-III

Representing Curves & Surfaces: Polygon meshes, parametric, Cubic Curves, geometric and parametric continuities, Hermite, Bezier (4-point, 5-point, general), B-Spline, Quadric Surface.

Illumination and Shading: Modeling light intensities, ambient light, diffused light, specular reflection, attenuation factor, Reflection vector.

Shading Models: constant shading, flat shading, gouraud shading, phong shading.

Color concepts: RGB color model, YIQ color model, CMY color model, HSV color model, HLS color model.

Hidden-Surface Removal: Hidden Surfaces and Lines, Back-Face Detection, A-buffer, Z-Buffers Algorithm, Scan-line Algorithm, The Painter's Algorithm, Area subdivision.

Introduction to Multimedia: Multimedia, Multimedia Terms, Introduction to making multimedia, The Stages of project, the requirements to make good multimedia, Multimedia Applications. **[10Hrs]**

UNIT-IV

Multimedia: Multimedia Hardware, Software and Authoring Tools, **Graphics File Formats:** TIFF, MIDI, JPEG, MPEG, RTF.

Multimedia building blocks: Text, Sound, Images, Animation and Video, Digitization of Audio and Video objects.

Data Compression: Different Compression algorithms for text, audio, video and images etc.

[10Hrs]

TEXT BOOKS:

1. Foley, Van Dam, Feiner, Hughes, "Computer Graphics Principles & Practice", 2013.
2. D.Hearn & Baker, "Computer Graphics, Prentice Hall of India", 1994.
3. Tay Vaughan, "Multimedia: Making it Work", TMH, 2000.
4. K. Andleigh and K. Thakkar, "Multimedia System Design", PHI, PTR, 2000.

REFERENCE BOOKS:

1. Rogers & Adams, "Mathematical Elements for Computer Graphics", McGraw Hill, 1989.
2. Rogers, "Procedural Element of Computer Graphics", McGraw Hill, 2001.
3. R. Plastock and G Kalley, "Theory and Problems of Computer Graphics", Schaum's Series, Mc Graw Hill, 1986.
4. Steve Heath, "Multimedia & Communication Systems", Focal Press, UK, 1999.

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Unit-I

Introduction to Microprocessor and Microcontroller:

Introduction to microprocessors, classification, basic architecture and its applications. Introduction to microcontrollers, classification, basic architecture and its applications. Difference between microprocessors and microcontrollers. **Programming:** Various programming languages to program Microprocessor and Microcontroller, High-level language, assembly language, machine language. **Tools:** Integrated development environment for application development, assemblers, compilers. **[10 Hrs]**

Unit-II

8085/8086 microprocessor:

Introduction to 8085 microprocessor: architecture, pin diagram, instruction set, and classification of instruction set, instruction and data format, timing diagram of instructions, basic concept of programming, addressing modes of 8085 microprocessors, 8086 architecture, BIU and EU, registers, pin diagram and Instruction set of 8086. **[10 Hrs]**

Unit-III

8051 Microcontroller:

8051 architecture, pin diagram, instruction set and classification of instruction set, instruction and data format, timing diagram of instructions, basic concept of programming, addressing modes. I/O Ports, SFRs, Timer, Counters, UART, SPI, I2C, External interrupt handling, Watch dog timer. **[10 Hrs]**

Unit-IV

8051 Interfacing and Applications: Interfacing Keyboard and Display Devices: LED, 7-segment LED display, LCD, ADC, DAC, DC motor, Stepper motor. **Advanced Microcontrollers:** Case study of AVR, ATMEGA, PIC and ARM microcontrollers. **[10 Hrs]**

TEXT BOOKS:

1. Ramesh S. Goankar, "Microprocessor Architecture, Programming and Applications with 8085", 5th Edition, Prentice Hall, 2002.
2. Douglas V. Hall, "Microprocessors and interfacing: programming and hardware", 2nd Edition, McGraw-Hill, 1990.
3. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems, Using assembly and C", 2nd Edition, Pearson, 2008.

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems", TMH, 2006.
2. K Ayala, "The 8051 Microcontroller", 3rd edition, Thomson Delmar Learning, 2007.
3. H.W Huang, Delmar, "PIC Microcontroller", CENGAGE Learning, 2007.
4. Andrew N. Sloss, Dominic Symes, Chris Wright and John Rayfield, "ARM System Developer's Guide, Designing and Optimizing System, Software", Elsevier, 2004.

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

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UNIT-I

Introduction: Goals and Applications of Networks, Layering Concept, OSI Reference Model vs TCP/IP Protocol Suite, Networks Topology. Physical Layer, Signals, **Digital Transmission:** Analog to Digital & Digital to Digital. **Analog Transmission:** Digital to Analog & Analog to Analog, Multiplexing: FDM & TDM, **Media:** Guided and Unguided, **Switching:** Packet based & Circuit based, Hub & Repeater, Sampling theorem (Nyquist-Shannon Theorem), **Network Traffic Capturing:** Wireshark (windows) and tcpdump (linux). **[10Hrs]**

UNIT-II

Data Link Layer: Addressing, Error Detection & Correction: General concepts, Checksum & CRC, **Medium Access:** Aloha, CSMA, CSMA/CD & CA, Protocols: Ethernet, ARP & RARP, **Switch:** Learning & Filtering Mechanism, Wireless Access (Bluetooth, Wifi). **Network Layer:** IP Addressing & Subnets, Basic Routing (or Forwarding) Mechanism, IPv4 frame format and functions, Routing protocols: RIP, OSPF & BGP and algorithms: Distance Vector & Link State. **Linux Network Commands:** arp, route, ifconfig, netstat, traceroute, ping. **[10Hrs]**

UNIT-III

Transport Layer: Port Addresses, Protocols: Simple, Stop n Wait, Go Back N & Selective Repeat, **UDP:** Services & Applications, **TCP:** header format, connection setup & termination, state transition diagram, flow control, error control, congestion control & timers. **[10Hrs]**

UNIT-IV

Application Layer: Web & HTTP, FTP, Email, Telnet, SSH, DNS. **Advanced Protocols:** SNMP, RTP, SIP, BitTorrent, Wireshark (Case Studies). **[10Hrs]**

TEXT BOOKS:

1. Forouzan, "Data Communication and Networking", TMH, 5th Edition, 2013.
2. A.S. Tanenbaum, "Computer Networks", PHI, 4th Edition, 2002.
3. W. Stallings, "Data and Computer Communication", Macmillan Press, 2013.
4. Comer, "Computer Networks and Internet", PHI, 2008.
5. Comer, "Internetworking with TCP/IP", PHI, 2008.

REFERNCE BOOKS:

1. W. Stallings, "Data and Computer Communication", McMillan, 2010.
2. J. Martin, "Computer Network and Distributed Data Processing", PHI, 2008.
3. W. Stallings, "Local Networks", McMillan, 2013.
4. S. Keshav, "An Engineering Approach to Computer Networking, Pearson", 2001.

INSTRUCTIONS TO PAPER SETTERS:**MAXIMUM MARKS: 60**

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UNIT-I

The Compelling Need for data warehousing, Data warehouse – The building Blocks defining the business requirements, **Requirements Definition**: scope and content, Principles of dimensional modeling, Dimensional Modeling.

OLAP in the Data Warehouse: Demand for Online analytical processing, need for multidimensional analysis, OLAP characteristics, features and functions, dimensional analysis, hyper cubes, Drill-down and roll-up, slice-and-dice, rotation, OLAP model, the MOLAP model, the ROLAP model, the HOLAP model, ROLAP versus MOLAP, OLAP implementation considerations. **[10 Hrs]**

UNIT-II

Data Mining Basics: Data Mining Definition, The knowledge discovery process, OLAP versus data mining, data mining and the data warehouse, Process of data mining. Data Mining Applications, Benefits of data mining.

Associations and Correlations – Association rule mining, Apriori algorithm, improving efficiency, kinds of association rules, multilevel, multi- dimensional. **[10 Hrs]**

UNIT-III

Classification and Regression: Types of classification algorithm, Bayesian, rule based, decision tree, KNN.

Cluster analysis: Overview of grid based, model based, density based, partitioning based, hierarchical based clustering methods. **[10 Hrs]**

UNIT-IV

Major Data Mining Techniques: Cluster detection, K-means algorithm, link analysis, neural networks, genetic algorithms, fuzzy logic, web mining, sentiment analysis, opinion mining. **[10 Hrs]**

TEXT BOOKS:

1. M.H. Dunham, “Data Mining Introductory and Advanced Topics”, Pearson Education, 2008.
2. Jiawei Han, Micheline Kamber, and Jian Pei, “Data Mining: Concepts and Techniques”, 3rd Edition, Morgan Kaufmann, 2011.

REFERENCES BOOKS:

1. Pieter Adriaans, Dolf Zantinge , “Data Mining”, Pearson Education Asia, 2001.
2. Ralph Kimball, “The Data Warehouse Lifecycle toolkit”, John Wiley, 2nd edition, 2007.
3. M Berry and G. Linoff, “Mastering Data Mining”, JohnWiley, 3rd edition , 2011.
4. Paul Raj Poonia, “Fundamentals of Data Warehousing”, John Wiley & Sons, 2004.

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UNIT-I

Human Values: Morals, Values and Ethics, Integrity, Work Ethic, Respect for Others, Living Peacefully, Caring, Sharing, Honesty, Valuing Time, Co-operation, Commitment, Empathy, Self-Confidence, Character, Spirituality. **Indian values (on the conceptual framework of Vedas):** Purusharth, Niskama karma, Religion and Human Values, Towards a World Religion, Ethical Living and Harmony in Life. **[8 Hrs]**

UNIT-II

Ethics and Engineering Profession: Profession and Professionalism, Ethical Theories: Kohlberg's Theory, Gilligan's Theory, Feminist Consequentialism, Moral Dilemmas, Types of Enquiry, Uses of Ethical Theories, Engineering Profession, **Engineering Professionals:** Training, Skill Set, Life Skills. **Engineering Ethics:** Making Senses and Issues, Ethical Obligations of Engineers, Ethical Codes for Engineers. **[7 Hrs]**

UNIT-III

Engineering as a Social Experimentation, Safety Responsibility and Rights: Engineering as experimentation, Engineers as responsible Experimenters, Concept of Safety and Risk, Engineer's Responsibility for Safety, **Risk : Benefit Analysis, Case Studies:** The challenger case study, The Three Mile Island, Fukushima Nuclear Disaster, Bhopal Gas Tragedy, Disaster Management, Professional Rights, Employee Rights, Intellectual Property Rights (IPRs), Human Rights and Human Responsibilities. Major Ethical Issues. **[8 Hrs]**

UNIT-IV

Ethics and Global Issues: Ethics in Global Scenario, Multinational corporations, Environmental ethics, computer ethics, Business Ethics, Corporate Social responsibility, Weapons Development, Research Ethics. **[7 Hrs]**

TEXT BOOKS:

1. Govindarajan M., Natarajan S., Senthil Kumar V. S., "Engineering Ethics", Prentice Hall, New Delhi, 2004.
2. Subramaniam R., "Professional Ethics", Oxford University Press, New Delhi, 2013.
3. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw-Hill, New York 1996.

4. RR Gaur, R Sangal, GP Bagaria, "A Foundation Course in Human values and Professional Ethics", Excel Books Pvt. Ltd, New Delhi 2009.
5. A.N.Tripathi, "Human Values", New Age International Publishers, New Delhi, 2nd Edition, 2004.

REFERENCE BOOKS:

1. B.P. Banerjee, "Foundation of Ethics and Management", Excel Books, 2005.
2. Fleddermann, Charles D., "Engineering Ethics", Pearson Education. 2004.
3. Harris, Charles E., Protchard, Michael S. And Rabins, Michael, J., Wadsworth, "Engineering Ethics- Concepts and Cases", Thompson Learning, 2000
4. Boatright, John R., "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
5. Swami Ranganathananda, "Universal Message of the Bhagavad Gita: An exposition of the Gita in the light of modern thought and modern needs", Vol. I – III, Advaita Ashrama (Publication Department), Kolkata. 2000.
6. Peter Singer, "Practical Ethics", Oxford University Press, 1993.

Paper Code: BIT 353	L	P	C
Paper Title: Computer Graphics & Multimedia Lab	0	4	2

Practical will be based on Computer Graphics & Multimedia.
(**Special Instructions:** Minimum Eight Experiments from Computer Graphics & Eight Experiments from Multimedia must be performed)

Paper Code: BCS 355	L	P	C
Paper Title: Microprocessor & Microcontroller Lab	0	2	1

Practical will be based on Microprocessor & Microcontroller System.

Paper Code: BIT 357	L	P	C
Paper Title: Data Communication & Computer Networks Lab	0	2	1

Practical will be based on Data Communication & Computer Networks.

Paper Code: BIT 359	L	P	C
Paper Title: Data Warehousing & Data Mining Lab	0	2	1

Practical will be based on Data Warehousing & Data Mining.

(NOTE: Minimum eight experiments must be performed.)

INSTRUCTIONS TO PAPER SETTERS:

Maximum Marks : 60

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UNIT-I

Introduction to Mobile Architecture: Mobile Architecture, Mobile Hardware Architecture, Mobile Software Architecture, Mobile Architecture vs Computer Architecture, Memory organization, Input and output devices for handheld devices and Booting of Mobile devices and a case study of any mobile device. [10 Hrs]

UNIT-II

Hardware and Software Architecture: Introduction to the processors used for Mobile and Handheld devices and SoC architecture like Intel and Snap Dragon etc. **Software Architecture:** Introduction to Real Time Operating systems and Mobile Real Time Operating Systems. Tool chain (SDK's) for Mobile Application Development [10 Hrs]

UNIT-III

Introduction to Mobile Operating System: Introduction to SDK and its installation, Layered Architecture of Android and Windows Phone, Protocols, services for Mobile Application Development and Complete life cycle of mobile application development and publication, Difference between Android and Windows Phone. [10 Hrs]

UNIT-IV

Mobile Programming: Introduction to the Mobile Programming Languages and its selection, Introduction to Python and shell programming, Programming the display, Keyboard/ touch, accessing camera, multimedia (Audio and Video), on device sensors, protocols like GSM (dialing a number, SMS), GPS etc., Testing and deploying these applications on SDK and on the device, Brief Introduction to HTML5, Mobile App, MWebsite, Web App, Introduction to iPhone. [10 Hrs]

TEXT BOOKS:

1. Tommi Mikkonen, "Programming Mobile Devices: An Introduction for Practitioners", John Wiley & Sons Ltd, 2007.
2. Henry Lee and Eugene Chuvyrow, "Beginning Windows Phone 7 Development", Apress 2010.
3. J Scheible and Ville Tuulos John, "Mobile Python Rapid Prototyping of Applications on the Mobile Platform" Wiley India Pvt. Ltd, 2008.
4. Reto Meier, "Professional Android 4 Application Redevelopment", Wiley India Private Ltd-2014.

REFERENCE BOOKS:

1. Nick Lecrenski, Karli Watson, "Windows Phone 7 Application Development" version 2011.
2. S. Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions," Wiley, 2009.

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Unit-I

Introduction: Introduction to Translators (interpreter, compiler & cross-compiler), Phases of compilation and overview, Introduction to GCC. **Lexical Analysis (scanner):** Regular language, finite automata, regular expression and their applications to lexical analysis, from regular expression to finite automata, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, ambiguity, YACC.

[10 Hrs]

Unit-II

Syntax Analysis (Parser): Context-free language and grammar, **Basic Parsing Techniques:** Parsers, Top down parsing, Shift reduce parsing, operator grammar, operator precedence parsing, predictive parsers. LL(1) grammar, LR(0), SLR(1), LR(1), LALR(1) grammars and Bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc,bison).

[10 Hrs]

Unit-III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser.

Semantic Analysis: Attribute grammar, syntax directed definition, evaluation and flow of attribute in a syntax tree.

[10 Hrs]

Unit-IV

Symbol Table: Data structure for symbols tables, representing scope information, symbol attributes and management. **Run-time environment:** Procedure activation, parameter passing, value return, memory allocation, and scope. **Error Detection & Recovery:** Lexical Phase errors, syntactic phase errors semantic errors.

Intermediate Code Generation: Translation of different language features, different types of intermediate codes.

Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc., Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

[10 Hrs]

TEXT BOOKS:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education, 2007.
2. Andrew N. Appel, "Modern Compiler Implementation in C", Cambridge University Press, 2007.

REFERENCE BOOKS:

1. Keith D. Cooper and Linda Torczon, "Engineering a Compiler", Elsevier, 2004.
2. Steven S. Muchnik, "Advanced Compiler Design and Implementation", Elsevier, 2008.
3. Randy Allen and Ken Kennedy, "Optimizing Compilers for Modern Architectures", Elsevier, 2009.
4. John R. Levine, Tony Mason, Doug Brown, "lex & yacc ", O'reilly, 2nd Edition, 1992.

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Unit-I

Introduction: Overview of UNIX OS, Environment of a UNIX process, Process control, Process relationships Signals, Interprocess Communication, overview of TCP/IP protocols, Case study-Java RMI. **[10 Hrs]**

Unit-II

Socket: Introduction to Socket Programming, **Introduction to Sockets:** Socket address Structures, Byte ordering functions, address conversion functions, Elementary TCP Sockets, socket, connect, bind, listen, accept, read, write, close functions, Iterative Server Concurrent Server, APACHE Web Server. **[10 Hrs]**

Unit-III

Advanced Socket: IPV4 and IPV6 interoperability, threaded servers, thread creation and termination, TCP echo server using threads, Mutexes, condition variables, raw sockets, raw socket creation, raw socket output, raw socket input, ping program, trace route program. **[10 Hrs]**

Unit-IV

Remote procedure call concept (RPC): RPC models, analogy between RPC of client and server, remote programs and procedures, their multiple versions and mutual exclusion communication semantics, RPC retransmits, dynamic port mapping ,authentication, Network file system, concept of data link access, debugging techniques,Routing sockets, broadcasting to mobile network. **[10 Hrs]**

TEXT BOOKS:

1. W.Richard Stevens, “Unix Network programming”, Addison-Wesley Professional,3rd edition, 2003.
2. Douglas E.Comer, “Internet working with TCP/IP”, Addison-Wesley, Vol-1, 2014.
3. Kevin R. Fall, W.Richard Stevens, “TCP/IP Illustrated: The Protocols”, Addison-Wesley Professional Computing Series, 2nd Edition, 2011.

REFERENCE BOOKS:

1. W. Richard Stevens, B. Fenner, A.M. Rudoff, “Unix Network Programming – The Sockets Networking API”, 3rd edition, Pearson, 2004.
2. W. Richard Stevens, S.A Rago, “Programming in the Unix environment”, 2nd edition, Pearson, 2005.

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Unit-I

Introduction to Computing and Cloud Computing: Trends in Computing, Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Concept and Evolution of cloud computing paradigm. Business driver for adopting cloud computing. Introduction to Cloud Computing, Benefits and challenges of cloud computing. Various types of cloud computing. **Cloud Computing Architecture:** Cloud delivery model, SPI framework, SPI evolution, SPI vs. traditional IT Model. **Infrastructure as a Service (IaaS):** IaaS service providers, Amazon EC2, GoGrid, Microsoft soft implementation and support, Amazon EC service level agreement, recent developments, Benefits. **Software as a Service (SaaS):** SaaS service providers, Google App Engine, Salesforce.com and google platform, Benefits, Operational benefits, Economic benefits, Evaluating SaaS. **Platform as a Service (PaaS):** PaaS service providers, Right Scale, Salesforce.com, Rackspace, Force.com, Services and Benefits.

[10 Hrs]

Unit-II

Virtualization: Virtualization concept and Operating System, Need of virtualization, cost, administration, fast deployment, reduce infrastructure cost, limitations. **Types of hardware virtualization:** Full virtualization, partial virtualization, para virtualization. **Desktop virtualization:** Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization. **Microsoft Implementation:** Microsoft Hyper V, VMware features and infrastructure, Virtual Box, Thin client.

[10 Hrs]

Unit-III

Cloud deployment model: Public clouds, Private clouds, Community clouds, Hybrid clouds, Advantages of Cloud computing, Performance and Resource management, load balancing, Energy model.

[10 Hrs]

Unit-IV

Best Practice Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture, How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO), Security aspects in cloud.

[10 Hrs]

TEXT BOOKS:

1. Barrie Sosinky, "Cloud Computing". Wiley Publishing House, 2011.
2. Michael J. Kavis, "Architecting the cloud: Design decision for cloud computing". John Wiley & Sons, 2014.

3. Rajkumar Buyya & James Broberg, "Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing)", Wiley-Blackwell, 2011.

REFERENCE BOOKS:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, "Cloud computing a practical approach", McGraw-Hill Osborne, 2009.
2. Thomas Erl, Ricardo Puttini, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall, Pearson Publications, 2013.

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MAXIMUM MARKS: 60

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UNIT-I

Introduction: What is AI? Philosophical Perspective, Weak vs Strong AI, Scope of AI, Intelligent Agent concept, Agents & Environment, Good Behavior, Nature of Environments & Structure of Agents.

Problem Solving (Informed and Uninformed Search): Problem Solving Agents, Uninformed Search - BFS, DFS, Depth limited & Bidirectional search, Informed Search Techniques, Hill climbing, Best-first search, Branch and bound, A* algorithm. [10 Hrs]

UNIT-II

Adversarial Search (Game Playing): Game Tree, Minimax Algorithm, Alpha Beta Pruning.
Knowledge and Reasoning: Logical Agents, Overview and Knowledge base, Propositional Logic, Predicate Logic, Unification, Resolution, Forward Chaining, Backward Chaining.
Structured Knowledge Representation: Semantic Nets, Slots, Exceptions, Conceptual dependency. [10 Hrs]

UNIT-III

Handling Uncertainty: Probability Notion, Axioms of Probability, Non-Monotonic Reasoning, Probabilistic reasoning, Use of certainty factors, Fuzzy logic. **Learning:** Forms of learning, Inductive Learning, Decision Trees, Statistical Learning, Naïve Bayes, Clustering & Nearest Neighbor, Neural Networks, Genetic Algorithms. [10 Hrs]

UNIT-IV

Natural Language Processing: Introduction, Syntactic Processing, Semantic Processing, Pragmatic Processing. **Expert Systems:** Overview, Characteristics & Design, Types of Expert Systems, MYCIN, Dendral, Knowledge acquisition. [10 Hrs]

TEXT BOOKS:

1. Stuart J. Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson 2nd Edition, 2009.
2. E. Rich and K. Knight, “Artificial Intelligence”, TMH, 2nd Ed., 1992.
3. Ela Kumar, “Artificial Intelligence”, I. K. International Publishing House, 2011.

REFERENCE BOOKS:

1. P. H. Winston, "Artificial Intelligence", Pearson Education, 3rd Edition, 2002.
2. D. W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.
3. R. J. Schalkoff, "Artificial Intelligence – An Engineering Approach", McGraw Hill Int. Ed. Singapore, 1992.
4. M. Sasikumar, S. Ramani, "Rule Based Expert Systems", Narosa Publishing House, 1994.
5. Tim Johns, "Artificial Intelligence, Application Programming", Wiley Dreamtech, 2005.

INSTRUCTIONS TO PAPER SETTERS:

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UNIT-I

Introduction: Meaning Nature and Significance of Economics, Economic Process, Micro Economics and Macro Economics. **Economy:** Definition, Types, Central Problems, Economic Development Indicators, Sustainable Development, a Glimpse of Indian Economy, Meaning of Science, Engineering and Technology and their relation with Economics, Role of Engineers in Economic Development. **[7 Hrs]**

UNIT-II

Demand Analysis: Meaning and Law of Demand, Demand Elasticity, Types and Uses, Demand Forecasting: Meaning and Uses, Supply Analysis, Production Function, Cost and Revenue Concepts, Producer's Equilibrium, Law of variable Proportion, Law of Returns to Scale.

Market: Meaning of Market, **Basic Features of Different markets:** Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition, and Price Determination under different Market Conditions. **[8 Hrs]**

UNIT-III

Money and Banking: Money, Meaning, Types and Functions, Bank Definition, Types and Functions, Credit Creation, Role of Central Bank- RBI, Introduction to Indian Financial system.

Inflation: Meaning, Types, Causes and Measures to Control Inflation, Monetary Policy, Fiscal Policy, Business Cycle, **National Income Concepts:** NNP_{FC} and GDP_{MP} .

[7 Hrs]

UNIT-IV

Financial Economics: Concepts of Time Value of Money, Interest, Cost, Annuity. **Project Evaluation Methods:** NPV, IRR, PI. **Introduction to Financial Management:** Role and Functions, Financial Accounting. **Uses of Important Financial Statements:** Statement of Profit and Loss, Balance Sheet, Cash flow Statement. **Decision making Models (No numerical Applications):** Linear Programming, Input Output Model, Econometric Models. **Introduction to Process Improvement Techniques:** TQM, Six Sigma, Benchmarking. **[8 Hrs]**

TEXT BOOKS:

1. Riggs, Bedworth and Randhawa, "Engineering Economics", McGraw Hill Education India. 1997.
2. K.K. Dewett, "Modern Economic Theory" S.Chand, New Delhi. 2005.
3. Seema Singh, "Economics for Engineering Students", I.K. International Publishing House, New Delhi. 2009.

4. D.N. Kakkar, "Managerial Economics for Engineering", New Age International Publication. 2014.
5. D.N. Dwivedi, "Managerial Economics" Vikas Publishing House. New Delhi. 2008.

REFERENCE BOOKS:

1. C. T. Horngreen, "Cost Accounting", Pearson Education India. 2012.
2. R. R. Paul, "Money banking and International Trade", Kalyani Publisher, New-Delhi. 2008.
3. S.C. Sharma and T.R. Banga, "Industrial Organization and Engineering Economics". Khanna Pub. 1999.
4. S.N. Maheswari, "Financial and Management Accounting" Sultan Chand & Sons. 2010.
5. Mishra & Puri, "Indian Economy", Himalaya Publishing House, New Delhi. 2000.

Paper Code: BCS 352	L	P	C
Paper Title: Mobile Architecture & Programming lab	0	2	1

Practical will be based on Mobile Architecture & Programming.

Paper Code: BCS 354	L	P	C
Paper Title: Compiler Design Lab	0	2	1

Practical will be based on Compiler Design.

Paper Code: BCS 356	L	P	C
Paper Title: Network Programming Lab	0	2	1

Practical will be based on Network Programming.

Paper Code: BCS 358	L	P	C
Paper Title: Cloud Computing Lab	0	2	1

Practical will be based on Cloud Computing.

Paper Code: BIT 360	L	P	C
Paper Title: Artificial Intelligence Lab	0	2	1

Practical will be based on Artificial Intelligence.

(NOTE: Minimum eight experiments must be performed.)

BACHELOR OF TECHNOLOGY (IGDTUW)
Computer Science and Engineering
(Teaching and Examination Scheme)
SEVENTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 401	Advance Computer Architecture	4	-	4	Departmental Core
2	BCS 403	Mobile Computing	4	-	4	Departmental Core
ELECTIVES-I (Choose Any One)						
1	BIT 401	Software Testing	4	-	4	Departmental Electives
2	BEC 401	Wireless Communication				
3	BIT 403	Big Data Analytics				
4	BCS 407	**Emerging trends in Computer Science and Engineering				
5	BCS 409	Soft Computing				
6	BCS 411	**Introduction to E-Commerce & M-Commerce				
ELECTIVES-II (Choose Any One)						
1	BMA 417	Process Improvement Techniques	3	-	3	Humanities & Social Sciences
2	BAS 419	Financial Accounting				
PRACTICAL/VIVA VOCE						
1	BCS 451	Advance Computer Architecture Lab	0	2	1	Departmental Core
2	BCS 453	Mobile Computing lab	0	2	1	Departmental Core
3	BCS 455	Practical based on Electives – I	0	2	1	Departmental Electives
4	BCS 457	*Minor Project	0	8	4	Departmental Core
5	BCS 459	Practical Training	-	-	2	Departmental Core
6	BAS 461	Disaster Management	-	2	1	Humanities & Social Sciences
TOTAL			15	14	25	

*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

** Any of these subjects may be chosen in E-Learning mode and supervised by Internal Faculty-in-Charge.

BACHELOR OF TECHNOLOGY (IGDTUW)
Computer Science and Engineering
(Teaching and Examination Scheme)
EIGHTH SEMESTER EXAMINATION

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 402	Embedded Systems Design	4	-	4	Departmental Core
2	BIT 404	Cyber Security and Management	4	-	4	Departmental Core
ELECTIVES-I (Choose any one)						
1	BCS 406	Real Time Systems	4	-	4	Departmental Electives
2	BIT 408	Natural Language Processing				
3	BCS 410	Advanced Database Management Systems				
4	BCS 412	**Wireless Sensor Networks				
5	BIT 414	IPR & Cyber Laws				
ELECTIVES-II (Choose any one)						
1	BAS 420	Business Entrepreneurship	3	-	3	Humanities & Social Sciences
2	BAS 422	Organizational Behavior				
PRACTICAL/VIVA VOCE						
1	BCS 452	Embedded Systems & Design Lab	0	2	1	Departmental Core
2	BIT 454	Cyber Security Management lab	0	2	1	Departmental Core
3	BCS 456	*Major Project	0	12	8	Departmental Core
TOTAL			15	16	25	
GRAND TOTAL					212	

*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

** Any of these subjects may be chosen in E-Learning mode and Supervised by Internal Faculty-in-Charge.

NOTE: 1. Total number of the credits of the B.Tech. Programme = 212

2. Each student shall be required to appear for examinations in all courses. However, for the award of the degree a student shall be required to earn the minimum of 204 credits without excluding core exams.

Paper Code: BCS 401

L P C

Paper Title: Advanced Computer Architecture

4 0 4

INSTRUCTIONS TO PAPER SETTERS:

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UNIT I

Introduction to parallel processing: Necessity of high performance, Constraints of conventional architecture, Parallelism in uni-processor system, Evolution of parallel processors, future trends, Architectural Classification, Applications of parallel processing, Instruction level Parallelism and Thread Level Parallelism, Performance Metrics and Measures, Speedup Performance Laws
(10 Hrs)

UNIT II

Pipelining Techniques : Linear Pipeline Processors , nonlinear pipeline processors, Instruction Pipeline Design- Instruction Execution Phases, Mechanisms for instruction pipelining, Dynamic Instruction Scheduling , Branch Handling Techniques , Arithmetic Pipeline Design - Computer Arithmetic Principles , Static Arithmetic pipeline, Multifunctional Arithmetic Pipelines, Superscalar Pipeline Design

(10 Hrs)

UNIT III

Parallel and Scalable Architectures: Multiprocessors and Multicomputers: Multiprocessor System Interconnects, Cache Coherence and Synchronization mechanisms, message passing mechanisms, Multivector and SIMD Computers: Vector Processing Principles, SIMD computer organization , Scalable, Multithreaded, and Dataflow Architectures

(10 Hrs)

UNIT IV

Software for Parallel Programming: Parallel Programming Models - Shared-Variable Model , message passing model, Data-Parallel Model , Object-Oriented Model, Functional and Logic Models, parallel languages and compilers, optimizing compilers for parallelism, Dependence Analysis of Data Arrays, Code Optimization and Scheduling, Loop Parallelization and Pipelining.

(10 Hrs)

Text Books:

1. Kai Hwang, Advanced Computer Architecture, Tata McGraw Hill Edition
2. Richard Y. Kain, Advanced Computer Architecture: a Systems Design, Prentice Hall
3. Quinn, Parallel Computing: Theory & Practice, TMH

References Books:

1. James M. Feldman, Charles T. Retter, Computer architecture: a designer's Text Based on a generic RISC, McGraw-Hill
2. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, Elsevier.
3. Dezso and Sima, Advanced Computer Architecture, Pearson.

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UNIT-I

Introduction: Mobile Computing, Motivations, concepts, and challenges of mobile computing, Architecture of Mobile Computing. Mobile computing environments, challenges and applications. Various Communication Radio Technologies, Security and Privacy issues.
(10 Hrs)

UNIT-II

Wireless System and Standards: Cellular concept, frequency allocation. Global System for Mobile Communication GSM architecture and its interfacing, call routing in GSM, location management, HLRVLR, Mobility Management, Handoffs. Introduction to LAN Protocols.
(10 Hrs)

UNIT-III

Data Management: Introduction, GPRS and Packet Data Network, GPRS Network architecture, operation and Data Services, Applications and Limitations of GPRS. **CDMA and 3G:** Introduction, Spread spectrum technology, CDMA versus GSM, 3G &4G Networks. Introduction to Dynamic routing algorithms
(10 Hrs)

UNIT-IV

Emerging Technologies: Bluetooth technology, protocols and interfacing, Voice over IP and its Application. IPV6, Mobile IP. Location Based Services, Context aware Computing, data broadcasting and file management CODA file system. QoS issues in mobile Computing
(10 Hrs)

Text Books:

1. Asoke K Telukder, Roopa R Yavagal, “ Mobile Computing”, TMH, 2011.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007
3. Yi-Bing Lin & Imrich Chlamtac, “Wireless and Mobile Networks Architectures”, John Wiley & Sons, 2001.

Reference Books:

1. Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, Cambridge University Press, October 2004.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional, 2005.
3. Hansmann, Merk, Nicklous, Stober, “Principles of Mobile Computing”, Springer, second edition, 2003.

INSTRUCTIONS TO PAPER SETTERS:

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UNIT 1

Introduction: Testing Objectives, Software Testing Process, , Software Testing Principles, Tester Role in Software Development Organization, Test Case Implementation and Execution,. Testing Concepts: Levels of Testing, Test, Test Cases Design and Strategy, Test suit, Test Plan, Testing as a Process, Testing and Debugging, Limitations of Testing, Software, Testing Tools: Explain Manual and automatic testing, Tools: Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools, Process management tools,

(10 Hrs)

UNIT 2

Functional Testing: Boundary Value Analysis, Robustness Testing, Worst case testing, Special Value Testing, Equivalence Class Testing-Weak normal, Strong normal, weak robust and Strong Robust, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing: Control flow testing-Statement, Branch, Condition and Path coverage, Data Flow Testing-Identification of du and dc paths, testing strategies, Generation of test cases, Slice based testing- Mutation testing Integration Testing – Decomposition based Integration, Call Graph based Integration, System Testing: Thread Testing,

(10Hrs)

UNIT 3

Introduction to Object Oriented Testing State Based Testing, Class Testing: Object Oriented Testing, Web Testing, Issues in Object Oriented Testing. Regression Testing: Regression testing, selection of test cases, reducing the number of test cases, Prioritization guidelines, Priority Category.

(10Hrs)

UNIT 4

Software Verification Methods, SRS Verification, SDD Verification, Source Code Reviews, Software Project Audit, Debugging: Debugging process and approaches Software Testing Metrics: Categories of Metrics, Metrics Used in Testing, Software Quality and Quality Models

(10Hrs)

Text Books:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, 2011
2. Paul C. Jorgensen, “Software Testing: A Craftsman's Approach”, Auerbach Publications; 3rd Edition, 2013

References Books:

1. Ilene Burnstein, “Practical Software Testing: A Process-Oriented Approach”, Springer, 2003.
2. Aditya P. Mathur, “Foundations of Software Testing”, Prentice Hall 2008

INSTRUCTIONS TO PAPER SETTERS:**Maximum Marks :60**

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UNIT I

Cellular Concepts - System Design Fundamentals: Cellular concept, Channel reuse, handoff strategies, dynamic resource allocation interference and system capacity, improving capacity and coverage of cellular systems.

Second and third generation network standards: GSM standardization, architecture and function Partitioning. GSM radio aspects, security aspects, protocol model, call flow sequences, evolution to 2.5G mobile radio networks, IS-95 service and radio aspects, key features of IS-95 CDMA systems- ECWDM, UMTS physical layer, UMTS network architecture, CDMA 2000 physical layer. **(10Hrs)**

UNIT II

Radio Wave Propagation: Free space propagation model, basic propagation mechanisms– reflection, ground reflection model diffraction, scattering, practical link budget design, outdoor and indoor propagation models

Small scale fading and multipath: Small scale multipath propagation, Impulse response model of a multipath channel - small scale multipath measurements, parameters of mobile multipath channels, Types of small scale fading. **(10Hrs)**

UNIT III

Capacity of Wireless Channels: Capacity of Flat Fading Channel, Channel Distribution Information known, Channel Side Information at Receiver, Channel Side Information at Transmitter and Receiver, Capacity with Receiver diversity, Capacity comparisons, Capacity of Frequency Selective Fading channels.

Performance of digital modulation over wireless channels: Error probability of BPSK, FSK, MSK, GMSK, QPSK, M-ary PSK, M-ary QAM and M-ary FSK on AWGN channels, Fading, Outage Probability, Average Probability of Error, Combined Outage and Average Error Probability. **(10Hrs)**

UNIT IV

Performance Estimation and Evaluation: Estimation of Performance Measures, Estimation of SNR, Performance Measures for Digital Systems, Importance sampling method, Efficient Simulation using Importance Sampling, Quasi Analytical Estimation.

Next Generation Wireless Network: Evolution of Public Mobile Services, First Wave of Mobile Data Services: Text-Based Instant Messaging, Second Wave of Mobile Data Services: Low-Speed Mobile Internet Services, Current Wave of Mobile Data Services: High-Speed and Multimedia Mobile Internet Services. IP-Based Wireless Networks - 3GPP, 3GPP2.

(10Hrs)**Text Books:**

1. Andrea Goldsmith, “Wireless Communications,” Cambridge University Press, 2010.
2. T.S. Rappaport, “Wireless Communications,” Pearson Education, 2013.

3. William C.Y. Lee, "Wireless and Cellular Telecommunications," Third edition, McGraw-Hill, 2006.

References Books :

1. S. Raj Pandya, "Mobile and Personal Communication Systems and Services," Prentice Hall of India, 2002.
2. Raymond Steele, ed. "Mobile Radio Communications," IEEE Press, New York, 1992.
3. V.K. Garg and J.E. Wilkes, "Wireless and personal Communication Systems," PHI, 1996.
4. A.J. Viterbi, "CDMA: Principles of Spread Spectrum Communications," Addison Wesley Wireless Communication Series, New York, 1995.

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Unit I

Introduction – RDBMS Overview, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools, Statistical Concepts: Sampling Distributions, Re-Sampling, Statistical Inference, Prediction Error, Accuracy measures, Cutoff, Oversampling & Asymmetric Costs.

Big Data - Volume, Velocity, Variety, Veracity, types & sources of Big Data OLAP & RTAP.

(10 Hrs)

Unit II

Data Exploration & Dimension Reduction: Data Summaries, Data Visualization, Correlation Analysis, Reducing no of categories in Categorical variables, Principal Component Analysis for classification & prediction, Multiple Linear Regression, Transforming Data into Actionable Results.

(10 Hrs)

Unit III

Introduction to Ontology, Big Data Ontologies, Classification of Business data:- Naïve Bayes Classifier, K-Nearest Neighbour, Classification Tree, Discovering Association Rules in Transactional Databases. Clustering Techniques: Hierarchical and K-Means, Clustering of High Dimensional data – CLIQUE

(10 Hrs)

Unit IV

Hadoop - The Hadoop Distributed File System – Components of Hadoop, Analyzing the Data with Hadoop, Map Reduce, Map Reduce Types and Formats, Map Reduce Features, NoSQL, Applications on Big Data Using Pig and Hive, Querying Data in Hive through HiveQL

(10 Hrs)

Text Books:

1. Chris Eaton, Dirk De Roos, Tom Deutsch, George Lapis, Paul Z., “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill Publishing, 2011
2. Shmueli, Patel & Bruce, “Data Mining for Business Intelligence”, 2nd Edition, Wiley Interscience Publications, 2010.

References Books

1. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses”, Wiley Publications, 2013.
3. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.

4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

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UNIT-I

Grid Computing: Introduction to grid computing, architecture, its applications and case study.

Cloud Computing: Evolution of Cloud Computing, Cloud Computing Reference Architecture - IaaS – On-demand Provisioning – Elasticity in Cloud – E.g. of IaaS Providers - PaaS – E.g. of PaaS Providers - SaaS – E.g. of SaaS Architectural Design of Compute and Storage Clouds .

(10 Hrs)

UNIT-II

Big Data and Semantic webs: Introduction to BigData Platform – Challenges of Conventional Systems, Four V's of Big Data, Modern Data Analytic Tools, MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File systems. Intelligent information and NLP techniques, introduction and applications of semantic webs.

(10 Hrs)

UNIT-III

Social Media and Impact of Emerging Trends: Introduction of social media, Types of social media, Analysis of social media, Case Study (facebook, gmail, twitter, youtube) and their tools, Introduction of social network

(10 Hrs)

UNIT-IV

Introduction to IOT (internet of things): Overview of IOT, IOE (Internet of everything) protocols, layered architecture, Tools and OS, Applications.

(10 Hrs)

Text books :

1. Asoke K Talukder, Roopa Yavagal, Mobile computing -Technology, Applications, and Service Creation by McGraw-Hill

2. WH Inmon and Dan Linstedt Data Architecture: A Primer for the Data Scientist: Big Data, Data Warehouse and Data Vault

3. Internet of things, IBM Redbooks, 2013.

Reference Books:

1. Shambhu Upadhyaya, Abhijit Chaudhury, Kevin Kwiat, Mark Weiser, Mobile Computing: Implementing Pervasive Information and Communications Technologies, Volume 19, 2002 Springer.

2. Imielinski, Tomasz, Korth, Henry F. (Eds), Mobile Computing The Springer International Series in Engineering and Computer Science 1996.

3. Jennifer Golbeck, Analyzing the Social Web, Elsevier Science & Technology, Mar 12, 2013.

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UNIT I

Introduction of soft computing: soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Concept Of Uncertainty : Presence of uncertainty in real world problems, handling uncertain knowledge, degree of belief, degree of disbelief, uncertainty and rational decisions, decision theory, utility theory, concept of independent events, Bayes rule, Using Bayes rule for combining events.

(10 Hrs)

UNIT II

Rough Sets: Definition, Upper and Lower Approximations, Boundary Region, Decision Tables and Decision Algorithms. Properties of Rough Sets.

Fuzzy sets and fuzzy logic: Introduction to fuzzy logic, classical and fuzzy sets, overview of fuzzy sets, membership function, fuzzy rule generation, operations on fuzzy sets: compliment, intersection, union, combinations on operations, aggregation operation.

(10 Hrs)

UNIT III

Neural Networks :Overview of biological neurons, Mathematical model of Neuron, Perceptron and Multi Layer Perceptron, Learning in Artificial Neural Networks; Supervised, Unsupervised and Competitive Learning paradigms; Learning rules and Functions, Back propagation algorithm, RBF networks , Hopfield networks Associative Memories, Self Organizing Maps, Applications of Artificial Neural Networks

(10 Hrs)

UNIT IV

Nature Inspired Algorithms : Introduction, Evolutionary algorithms -Genetic Algorithm: History, terminology, biological background, creation of offspring, working principles of genetic algorithms, fitness function, Roulette wheel selection, Boltzmann selection, cross over mutation, inversion, deletion, and duplication, generation cycle , Swarm Optimization –Part Swarm Optimization and Ant Colony Optimization.

(10 Hrs)

Text Books:

1. Soft Computing, By Deepa Shivandan Das publication: John Wiley
2. Fuzzy & Neural and Genetic algorithm by Chandrasekharan, PHI
3. Fuzzy logic by John & Bays, T.J Ross, PHI publication

Reference Books

1. Fuzzy Logic: A spectrum of Theoretical and Practical issues, Paul P. Wang, Pearson publication 2004.
2. Fuzzy Sets, Fuzzy logic, and Fuzzy Systems: Selected Papers- Lotfi Asker Zadeh, George J. Klir, Bo Yuan, 2005.
3. Foundations of Fuzzy logic and Soft Computing: 12th International Fuzzy conference proceeding, 2005.
4. Nature-Inspired Metaheuristic Algorithms: Second Edition, Xin-She Yang, Luniver Press, 2010

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UNIT 1

Electronic Commerce Introduction:- Definition of E- Commerce ,Electronic commerce and Physical Commerce, Architectural framework, Impact of E-commerce on business, different type of ecommerce, some e-commerce scenario, Economic potential of electronic commerce, Advantages and Disadvantages , Incentives for engaging in electronic commerce, forces behind E-Commerce. **(10Hrs)**

UNIT 2

E-business strategy: Introduction, Characteristics of e-Business, Business models, E-Business vs E-commerce, , e-business Requirements, impacts of ebusiness, Strategic positioning, Levels of e-business strategies, Strategic planning process, Success factors for implementation of e-business strategies, CRM, MRP. ERP:- Introduction, need of ERP, Modules of ERP **(10Hrs)**

UNIT 3

Electronic Payment Methods: Overview, SET Protocol for credit card payment, E-cash, E-check, Micropayment system, Credit card, magnetic strip card, Smart cards, Electronics Data Interchange, ECommerce Law. Security Architecture, Encryption techniques, Symmetric & Asymmetric encryption, Digital Signatures, Virtual Private Network, IPsec, Threats, Firewalls. **(10Hrs)**

UNIT-4

M-Commerce: Introduction, Attributes, customer and provider views, Architecture, Infrastructure of m-commerce, Requirement of the m-commerce, characteristics, Mobile Information device, Mobile Computing Applications, Mobile wallet, Mobile payments, Mobile portals, , Pros and Cons of m-commerce , Secure Transaction Processes: Wireless Application Protocol, Bluetooth, The role of emerging wireless LANs and 3G/4G wireless networks. **(10Hrs)**

Text Books:

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
2. Brian Mennecke and Troy Strader, "Mobile Commerce: Technology, Theory and Applications", Idea Group, 2003.
3. Dave Chaffey, "E-Business and E-Commerce Management", Third Edition, 2009, Pearson Education.

Reference Books:

1. E-Commerce Fundamentals and application (Henry Chan), 1st edition, 2001, Wiley publication
2. Bajaj and Nag, "E-Commerce the cutting edge of Business", 2nd edition, 2005, TMH
3. P. Loshin, John Vacca, "Electronic commerce", Firewall Media, 1st edition, 2005, New Delhi
4. "Enterprise resource Planning- Concepts and Practice", V.K. Garg and N. K. Venkita Krishna, 1998, PHI.

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UNIT – I

Principles of Management: approaches to management thoughts, scientific management, functions of management **Organization:** Organization structure and organization design, The Process View of Organizations - Service and manufacturing processes – Nature of service processes, process structure in services, Process structure in Manufacturing , Value Chain – Core and support processes, adding value with processes. **(8Hrs)**

UNIT – II

Productivity, Value analysis and Value Engineering Concept, Procedure, Application and role in Productivity. **Process Improvement Techniques:** Total Quality Management(TQM), Basic Concept of Total Quality (TQ), Statistical Process Control, Programmes; Quality Improvement Teams; Marketing Aspect of T.Q.; Total Quality of Services; Total Quality and Safety; Six Sigma. **(7Hrs)**

UNIT – III

Benchmarking: Process and Benefits, Enterprise Resource Planning(ERP), Business Reengineering, Simulating business process – Application, simulation process, discrete event simulation, computer simulation. **(8Hrs)**

UNIT – IV

Constraint Management – theory of constraints, process layout – designing flexible flow layouts; Lean Systems – Toyota production system, characteristics of lean systems, continuous improvement, Kanban system Value stream mapping, JIT, Process Synchronization and Improvement. **(7Hrs)**

Text Books:

1. Manuel Laguna, Johan Marklund, “Business Process Modelling, Simulation and Design”, Pearson Education, 2011.
2. Poornima M.Charantimath, “Total Quality Management”, Pearson Education, First Indian Reprint 2003.
3. Shankar R., “Industrial Engineering and Management”, Galgotia Publication, 2002.
4. Mathur, K and Solow D., “Management Science”, Englewood Cliffs New Jersey, Prentice Hall Inc. 1994.

Reference Books:

1. Raví Anupindi, Sunil Chopra, Sudhakar Deshmukh, Jan A. Van Mieghem, and Eitan Zemel, “Managing Business Process Flows: Principles of Operations Management” Pearson Education, 2006

2. Douglas C. Montgomery, "Introduction to Statistical Quality Control", Wiley Student Edition, Wiley India Pvt Limited, 2008.
3. James R. Evans and William M. Lindsay, "The Management and Control of Quality", sixth Edition, Thomson, 2005.

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT – I

Introduction to Accounting, concept and objectives of accounting and bookkeeping, conventions and principles, Accounting Equation, International Accounting principles and standards, Matching of Indian Accounting Standards with International Accounting Standards, debit and credit entries, double entry principle, journal and journal entries; accounting of sole proprietorship. **(8Hrs)**

UNIT – II

Ledger posting and trial balance ,preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill. **(7Hrs)**

UNIT - III

Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis. **(8Hrs)**

UNIT – IV

Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its uses. **(7Hrs)**

Text Books

1. Maheshwari & Maheshwari, “An Introduction to Accountancy”, Vikas Publishing House, 2009.
2. Maheshwari S.N., “Principles of Management Accounting”, 11th Edition, Sultan Chand & Sons, 2001.
3. V.K. Gupta & R.L. Gupta, “Financial Accounting”, Sultan Chand & Sons, 2014.
4. Ghosh T.P. “Financial Accounting for Managers”, Taxman, 2009.

Reference Books:

1. Narayanswami, “Financial Accounting: A Managerial Perspective”, PHI, 2014
2. Ramchandran & Kakani, “ Financial Accounting for Management”, TMH, 2011.
- 3 Ashish K. Bhattacharya, “Financial Accounting for Managers”, PHI, New Delhi, 2006.

Paper Code: BAS 461
Paper: Disaster Management

L P C
0 2 1

Objective: The course will focus on the areas of disaster management and preparedness, the relationship of different disaster management activities with mock drills and use of ICT for managing disaster.

Total Hrs: 20

UNIT I

Concepts and definitions of disaster - hazard, vulnerability, resilience, risks, Difference between accidents and disasters Categories of disasters -Natural disasters – earthquake, cyclone and hurricane, flood, tsunami, fire, Man-made disasters – technological, armed conflict and civil strife, Nuclear and gas leakage disasters, Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams. Strategic Planning for Disaster Preparedness, Recovery and Management of Disasters.

(12Hrs)

UNIT II

Technology disasters, Business Continuity Planning and Recovery, Disaster Policy of India (Salient Features). Use of ICT, mobile technology, alarms etc. for managing disaster.

(8Hrs)

Text books

1. Alexander David, Introduction in Confronting Catastrophe, Oxford University Press, 2000.
2. Kapur, Anu & others, Disasters in India Studies of grim reality, Rawat Publishers, Jaipur, 2005.
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011

Reference Books

1. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008.
2. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi

Paper Code: BCS-402

L P C

Paper Title: Embedded Systems Design

4 0 4

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT I

Introduction: Embedded system and general purpose computers, Embedded system components, Embedded System Design Process, Classification of an embedded system, Examples of an embedded system, Applications of an embedded system, Processor Selection for embedded systems and its issues, Embedded controllers, Memory selection, Programming language/tool selection, IDE selection. **(10 Hrs)**

UNIT II

Implementation Platforms and Its Programming: The ARM programmer's model, ARM development tools, ARM instruction set: Software interrupt (SWI) Interrupt Service Routines-Writing simple assembly language programs for ARM, 3-stage pipeline ARM organization Comparison between ARM and Atom processors. Introduction to Reconfigurable platforms (SoC, FPGA) **(10 Hrs)**

UNIT III

RTOS: Operating system service, RTOS architecture, Process management, Timer and Event function, Memory management, Device , File and I/O subsystem management, Interrupt routine in RTOS environment and handling of interrupt service calls, Watch dog timer, Real time clock, Customizing OS for Embedded system, Introduction to Embedded C. Case study of Mbed OS and RT Linux **(10 Hrs)**

UNIT IV

Advanced Processors for Embedded Systems: Intel architecture for Embedded System and IoT (Intel Atom architecture, Intel Galileo) Interfacing, Programming of Peripherals such as LCD ,Sensors (Temperature, Humidity, PIR etc), Buzzer and Bluetooth . Introduction to H/W and S/W co-design. **(10 Hrs)**

Text Books:-

1. William Hohl, ARM Assembly Language: Fundamentals and Techniques, CRC Press, Second Edition.
2. Steve Heath, Embedded Systems Design, Newnes(Elsevier) publications ,Second Edition,
3. Manoel Ramon, Intel Galileo Gen 2 and Intel Edison for Beginners: A Hands-on Introduction, A press Open

Reference Books:

1. Dr.K.V.K.K.Prasad, Embedded/Real Time Systems: Concepts, Design and Programming, Dream Tech press, Black Book, 2005.
2. Wayne Wolf, Computer as Components: Principles of Embedded Computer System Design Princeton University.
3. Arnold S. Berger, Embedded System Design: An introduction to Processes Tools and Techniques, Viva CMP Books.

Paper Code: BIT 404
Paper: Cyber Security and Management

L P C
4 0 4

INSTRUCTIONS TO PAPER SETTERS:

Max. Marks: 60

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- 2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks**

UNIT - I

Importance of Information Protection, The evolution of Information Security, Justifying Security Investment, Security Methodology, Building Security Program, Security Goals, Services and Mechanism, Attributes of Information Security, Confidentiality, Integrity, Authentication, Availability and Non repudiation, Secure Design Principles, Defence Models, The Lollipop Model, The Onion Model,

(10 Hrs)

UNIT – II

Cryptography Basics, Symmetric Vs asymmetric Cryptography, Key Management, Public Key Cryptography and Applications: RSA, Elliptic Curve Cryptography, Message Authentication Code, Message Digest, Properties of Message Authentication Code, Hash Function, Properties of Hash Function, Secured Hash Algorithm, Digital Signatures, Digital Signature Standard

(10 Hrs)

UNIT - III

Fundamentals of Computer Forensics, Computer Forensics Technology, Live data collection from Windows systems, Live data Collection from Unix systems, Data Acquisition of digital evidence from electronic media, Evidence collection and preservation, Network Forensics, Email Investigations, Mobile device forensics, Computer Forensics Analysis and Validation, Incident Report preparation.

(10 Hrs)

UNIT - IV

Risk Analysis : Threat Definition, Threat Vectors, Threat Sources and Targets, Types of Attacks, Malicious Mobile Codes, Advance Persistent Threats, Manual Attacks, Risk Analysis, Compliance with standard regulation and laws, Information Security Standards, COBIT, ISO 27000 series, NIST, Vulnerabilities, Cyber laws, Indian IT Act, Case study: Recent security attacks in critical information infrastructures and its management.

(10 Hrs)

Text Books:

1. Mark Rhodes, “The complete reference Information security”, 2nd Edition, McGraw Hill, 2013.
2. William Stallings, “Cryptography and Network security Principles and Practices”, 6th Edition, Pearson Education, 2013.

Reference Books

1. B A Forouzan, Debdeep Mukhopadhyay, “ Cryptography and Network Security”, 2nd Edition, McGraw Hill Education, 2010
2. Matt Bishop, “Computer Security: Art and Science”, 1st Edition, 2002, Addison Wesley.

Paper Code: BCS 406
Paper Title: Real Time Systems

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INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT-I

Introduction to Real-time Systems: Introduction, Characterizing real time systems and tasks, Embedded systems, Hard Versus Soft Real-Time Systems, Typical Real-Time Applications, Reference Model of Real-Time Systems, Modeling Timing constraints **(10 Hrs)**

UNIT-II

RTOS: Scheduling Real-Time Tasks- Types of Schedulers, Table-driven scheduling, Cyclic schedulers, EDF, RMA, Clock-Driven Scheduling, Priority-Driven Scheduling of Periodic Tasks, Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems **(10 Hrs)**

UNIT-III

Real-time Communication: Handling Resource sharing among real-time tasks, Scheduling Real-Time Tasks in Multiprocessor and distributed systems, Commercial Real-time operating systems: Case study of commercial RTOS[VxWorks, RT Linux] **(10 Hrs)**

UNIT-IV

Issues in Real-time Systems : Real-Time Communication- network topologies, protocols., Real-Time Databases – Real time vs general purpose databases, main memory databases, Concurrency control issues, databases for hard real time systems, fault tolerance techniques – reliability. Emerging trends in real-time system(IoT, Pervasive Computing, distributed systems) **(10 Hrs)**

Text Books:

1. Rajib Mall, Real-Time Systems: Theory and Practice, Pearson, 2008
2. Krishna and Shin, Real-Time Systems, Tata McGraw Hill. 1999.
3. Jane W. Liu, Real-Time Systems, Pearson Education, 2001.

Reference Books:

1. Alan C. Shaw, Real-Time Systems and Software, Wiley,2001.
2. Philip Laplante, Real-Time Systems Design and Analysis, 2nd Edition, Prentice Hall of India.
3. Seyed Morteza Babamir, Real-Time Systems, Architecture, Scheduling, and Application, IN-TECH (April , 2012).

Paper Code: BIT 408
Paper Title: Natural Language Processing

L P C
4 0 4

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT – I

Introduction to NLP: General Characteristics of Natural language, Brief history and Challenges: ambiguity, incompleteness, imprecision, Language structure, NLP tasks in syntax, semantics and pragmatics, Machine Learning and NLP.

Word and Word Forms: Regular Expressions, Morphology, and Finite State Transducers, Word class and POS Tagging, Shallow Parsing, Introduction to Phonology. **(10 Hrs)**

UNIT – II

Grammars and Parsing: Grammars and sentence structure, Overview of CFG, Parsing with Context-Free Grammars, Lexicalized and Probabilistic Parsing, Brief Introduction to Semantics & Pragmatics, Lexical semantics. **(10 Hrs)**

UNIT- III

Machine Translation: Introduction, Challenges in Machine Translation, Classical Approaches to machine Translation, Introduction to Statistical Machine Translation, Introduction to IBM Models 1 and 2, N-Grams and Language Models, Markov Process, Tri-Gram Language Models, Evaluation of Machine Translation. **(10 Hrs)**

UNIT-IV

Statistical Techniques: Elementary Probability theory, Essential information theory, Hidden Markov Model, Expectation Maximization.

Applications of Statistical Techniques: POS Tagging, Named Entity Recognition and Word SenseDisambiguation. **(10 Hrs)**

Text books-

1. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008
2. Akshar Bhartati, Sangal and Chaitanya, Natural language processing , Eastern Economy Edition, PHI, New Delhi, 1996.

Reference Books

1. P.Syal and D.V.Jindal, an introduction to Linguistics: language grammar and semantics, Eastern Economy Edition, PHI, 2007.
2. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
3. Philipp Koehn, Statistical Machine Translation, Cambridge University Press.

Paper Code: BCS-410

Paper Title: Advanced DBMS

L P C
4 0 4

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT-I

Introduction: DBMS Architecture and Components, Relational Model and its difficulties, Advantages and Disadvantages; Data models: ER, EER, Network, Hierarchical and Relational data models; Normalization and de-normalization, Object Oriented Databases, Need for complex data types, Object Relational Systems **(10 Hrs)**

UNIT-II

Query Processing: General strategies for query processing, query processor, syntax analyzer, Query decomposition, Heuristic Query optimization, Cost estimation., Selection Operation, Sorting, Join operation, evaluation of expressions, Query Optimization, estimating statistics of expression results, transformation of Relational Expressions, Choice of evaluation plans, Materialized Views. **(10 Hrs)**

UNIT-III

Distributed Databases: Basic concepts, architectures, parallelization of operations, Methods for data distribution: fragmentation and replication, **Distributed Databases:** Homogeneous & Heterogeneous Databases, Distributed Data Storage, Distributed Transactions and their commit protocols, Concurrency Control in Distributed Databases, Distributed Query Processing, Decision Support Systems. **(10 Hrs)**

UNIT-IV

Databases for Advanced Applications: Data warehouse Vs. DBMS, architecture, Data mining systems, KDD process, Web databases, Information retrieval and XML. Knowledge-based approaches, Conceptual Graphs, Applications, Information Extraction, Automatic Text Summarization Systems, and Question Answering Systems. Emerging Issues in Databases

(10 Hrs)

Textbooks :

1. Silberchatz, Korth, Sudershan, Data base System Concepts, Tata MC Graw Hills Publishing. , 5th Edition, 2005
2. Raghu Ramakrishnan, J.Gerkhe, Database Management Systems, Tata MC Graw Hill Publications. 3rd Edition, 2003
3. G.J. Kowalski, M.T. Maybury, Information Storage & Retrieval Systems :- Theory & Implementation 1st edition,2000

References :

1. D.A Grossman, O.Frieder, Information Retrieval, Springer Publication. 2nd edition, 2004
2. Bipin C. Dcsai, An Introduction to database systems, Galgolia Publications.
3. S.K. Singh, Database systems : concepts, design and applications, Pearson education, 2009

Paper Code: BCS-412

L P C

Paper Title : Wireless Sensor Networks

4 0 4

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT I

Introduction: Mobile Ad-hoc Networks (MANETs), Introduction to Sensor Networks, Constraints and Challenges, Advantage of Sensor Networks, Applications of Sensor Networks.

Architecture: Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems, Network Architecture -Sensor Network Scenarios, Optimization Goals, Gateway Concepts. **(10 Hrs)**

UNIT II

Networking Sensors: Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, classification of MAC protocols, MAC protocols for sensor network, location discovery, S-MAC, IEEE 802.15.4. Routing Protocols- Energy-Efficient Routing, Geographic Routing. **(10 Hrs)**

UNIT III

Infrastructure Establishment: Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control. Case study of WSN's for different applications. **(10 Hrs)**

UNIT IV

Platform, Tool and Security: Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators. Security issues in Sensor Networks. Future Research Direction. **(10 Hrs)**

Text Books

- 1.Holger Karl & Andreas Willig, Protocols And Architectures for Wireless Sensor Networks , John Wiley, 2005.
- 2.Feng Zhao & Leonidas J. Guibas, Wireless Sensor Networks- An Information Processing Approach, Elsevier, 2007.
- 3.C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and Protocols, Pearson Education,. 2nd edition

Reference Books

- 1.Dr.Xerenium, Shen, Dr. Yi Pan , Fundamentals of Wireless Sensor Networks, Theory and Practice,
- 2.Wiley Series on wireless Communication and Mobile Computing, 1st Edition, 2010.
- 3.KazemSohraby, Daniel Minoli, &TaiebZnati, Wireless Sensor Networks- Technology, Protocols, And Applications, John Wiley, 2007.
- 4.BhaskarKrishnamachari , Networking Wireless Sensors, Cambridge university press, 2005.
- Anna Hac, Wireless Sensor Network Designs, John Wiley, 2003.

Paper Code: BIT-414
Paper: IPR and Cyber Laws

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INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

- 1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 10 marks.**

UNIT 1

Introduction and need for Intellectual Property Right (IPR), Types of IPR, Legislation covering IPRS in India, Patent and kind of inventions protected by a patent. Understanding cyber laws, Scope of cyber laws, Need for cyber laws, law and legal system, Jurisprudence of Indian cyber law, Security threat to cyber space and e-commerce, Evolution of Cyber Crime.

(10 Hrs)

UNIT 2

Introduction to geographical indications, New plant varieties, Unfair competitions, Plant Breeder and TRIPS agreement. Copy rights, Rights covered by copyright, Protection of copyright, Trademarks, Rights of trademark, Signs used in trademarks, Types of trademark function, Protection of trademark, Registration of trademark, Domain name and how does it relate to trademarks, Cases related to IPR infringement.

(10 Hrs)

UNIT 3

Components of cyber laws in India - Information Technology Act and its amendment; Introduction of relevant provisions from Indian Penal Code, Indian Evidence Act, Bankers Book Evidence Act, Reserve Bank of India Act, etc. related to cyber security. Obscenity and pornography on Cyber space, Hacking, Punishment for violation of privacy under IT Act, Ministerial order on blocking of websites, Cyber laws in US, Cyber laws in global perspective, MLAT (Mutual Legal Assistance Treaty) international treaty for cyber laws.

(10 Hrs)

UNIT 4

Information Technology Act – a brief overview; Documents or transactions to which IT Act shall not be applicable; Meaning of computer, Computer system and Computer network. Protection of intellectual property rights in Cyber spaces in India, Plagiarism issues.

(10 Hrs)

Text Books:

1. B.L. Wadhwa, “Law Relating to Intellectual Property”, 5th Edition, Universal law publishing,2013
2. Harish Chander, “ Cyber Laws and IT Protection”, 1st edition, PHI, 2012

Reference Books:

1. Prof. Vimlendu Tayal “Cyber Law Cyber Crime Internet and E Commerce”, Bharat Law Publications,2011

Paper Code: BAS 420

L P C

Paper Title: Business Entrepreneurship

3 0 3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

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- 2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT – I

Introduction: The entrepreneur, definition, **characteristics**; leadership, risk taking, decision making and business planning, role of entrepreneur, entrepreneurship and an entrepreneurial perspective, significance of entrepreneurship, Innovation and entrepreneur, entrepreneurial behaviour and psycho-theories, social responsibility. **(8Hrs)**

UNIT – II

Promotion of a Venture: Opportunities analysis; external environmental analysis, economic, social and technological, competitive factors, fundamentals of feasibility plan, forms of business enterprises, Sole proprietorship, partnership and corporations, legal requirements of establishment of a new unit. **(7Hrs)**

UNIT – III

Financial resources, rising of funds and documentation required. Project financing: fixed and working capital requirements, equity financing, securities market, venture capital, debt financing, banks and financial institutions and other non-bank financial sources, Government programmes, direct loan assistance and subsidies. **(8Hrs)**

UNIT – IV

Managing growth and transition: the organization life cycle; The entrepreneur-s perspective, changing roles. Entrepreneurial Development Programmes (EDP): EDP, their role, relevance and achievements; role of government in organizing EDP's critical evaluation. **(7Hrs)**

Text Books

1. Vasant, DCSAI, "Entrepreneurship", Himalaya Publishing House, 2003.
2. Ram Chandran, 'Entrepreneurial Development', Tata McGraw Hill, New Delhi, 2008
3. Pandey I.M.; "Venture Capital –The Indian Experience", Prentice Hall of India, 2003.
4. Panda, Shiba Charan, " Entrepreneurship Development", Anmol Publications New Delhi, 2014.

Reference Books:

1. Srivastava S.B. “ A practical guide to industrial entrepreneurs”, Sultan Chand & Sons, New Delhi, 1992.
2. Chandra, Prasana, “Project Preparation, Appraisal, Implementation”, TMH, New Delhi, 2002.
3. Holt, David H., “Entrepreneurship: New Venture Creation”, Prentice-Hall of India, New Delhi, 1992

Paper Code: BAS 422

L P C

Paper Title: **Organizational Behaviour**

3 0 3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 60

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2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks.

UNIT – I

Introduction to Management and Organizational Behaviour: Introduction- Meaning and Nature of Management, Management Functions and Processes. Scientific Management Theories ; Taylor and Scientific Management; Evolution of Organizational Behaviour- Classical, Neo Classical and Modern Approaches, Contemporary School of Management Thoughts, Theories of Organization. **(8Hrs)**

UNIT – II

The Individual Behaviour- Factors affecting Individual Behaviour, Personality, Learning Process, Motivational Process, Perceptual Process, Attitudes and Values. **Group Behaviour:** Groups- Definition, Types, Theories of Group formation, Group Roles and Norms, Interpersonal relations, Group Dynamics, Leadership Styles & Leadership Development **(7Hrs)**

UNIT – III

Behaviour in the organization: Introduction, Issues between organizations and individuals. Interpersonal behaviour: Conflict in Organizations: nature of conflict, levels of conflict, conflict management styles. Management of Organizational Conflicts. Employee stress: forms, causes, implications, approaches to stress management. **(8Hrs)**

UNIT – IV

Organizational structure & Design, Organizational Designs; Emerging Design Options Different Organizational Structures; Communication Process, Organizational Culture (creation and sustenance of cultures) , Organizational Ethos, Dimensions of Culture, Model for Managing Change, Forces for Change, resistance to change, Management of resistance. **(7Hrs)**

Text books:

1. Stephen P. Robinson: Organisational Behaviour, 11th edition, New Delhi – 110001 Prentice – Hill of India Pvt. Ltd., 2007.
2. L.M.Prasad: Organizational Behaviour, New Delhi, Sultan Chand & Sons, 2001.
3. Udai Pareek, “Understanding Organizational Behavior”, 1st Ed, Oxford University Press., 2004.
4. Robbins, S. P., Judge, T. A. and Sanghi. S, “Organizational Behavior”, Pearson, 2009.

REFERENCES:

1. Stoner, et. al., "Management", PHI, 6th Ed., 2002.
2. J. S. Chandan, "Organizational Behaviour", Vikas Publishing House, 2004.
3. Joseph W. Weiss, "Organizational Behaviour & Change, Managing Diversity, Cross-Cultural Dynamics & Ethics", Vikas Publishing House, 2nd Ed. 2001.
4. Jit S Chandan: Organisational Behaviour, 3rd edition, 576, Masjid Road, Jangpura, N.D., New Delhi-1100014, Vikas Publishing House Pvt. Ltd., 2006.
5. Fred Luthans, "Organizational Behaviour," McGraw Hill International Edition, 9th Ed., 2002.
6. Kavita Singh, "Organization Behaviour Text and Cases", Pearson, 2010.

Paper Code: BIT 403
Paper Title: Big Data Analytics

L P C
4 0 4

INSTRUCTIONS TO PAPER SETTERS:

- 1 Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
- 2 Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

Unit I

Introduction – RDBMS Overview, Challenges of Conventional Systems, Intelligent Data Analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools, Statistical Concepts: Sampling Distributions, Re-Sampling, Statistical Inference, Prediction Error, Accuracy measures, Cutoff, Oversampling & Asymmetric Costs. Big Data - Volume, Velocity, Variety, Veracity, types & sources of Big Data OLAP & RTAP. (10 Hrs)

Unit II

Data Exploration & Dimension Reduction: Data Summaries, Data Visualization, Correlation Analysis, Reducing no of categories in Categorical variables, Principal Component Analysis for Classification & Prediction, Multi Variate Regression Analysis, Bayesian Modeling, Support Vector Method, Time Series Analysis. (10 Hrs)

Unit III

Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Case Study: Real Time Sentiment Analysis/Stock Market Prediction. (10 Hrs)

Unit IV

Hadoop - The Hadoop Distributed File System – Components of Hadoop, Analyzing the Data with Hadoop, Map Reduce, Map Reduce Types and Formats, Map Reduce Features, NoSQL Database. Applications on Big Data Using Pig and Hive, Querying Data in Hive through HiveQL (10 Hrs)

TEXT BOOKS

1. Chris Eaton, Dirk De Roos, Tom Deutsch, George Lapis, Paul Z., “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill Publishing, 2011
2. Shmueli, Patel & Bruce, “Data Mining for Business Intelligence”, 2nd Edition, Wiley Interscience Publications, 2010.

REFERENCE BOOKS

1. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses”, Wiley Publications, 2013.
3. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.

4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.