

# **M.C.A Syllabus**

**(Academic year 2018-2019 onwards)**

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), COIMBATORE – 641 018**  
*(An autonomous college affiliated to Bharathiar University)*  
*Reaccredited by NAAC with 'A' Grade*  
**EFFECTIVE FROM THE ACADEMIC YEAR 2018-2019**

**ELIGIBILITY FOR ADMISSION:**

The Eligibility for Candidates admitted to the first year course in Master of Computer Applications (M.C.A) is as per TANCET.

**DURATION OF THE COURSE:**

The course shall be offered on a full-time basis. The course will consist of five semesters of course work and laboratory work and the sixth semester shall be project work.

**REQUIREMENTS FOR EXAMINATION AND ATTENDANCE**

A candidate will be permitted to appear for the semester examinations if, he/she secures not less than 75% of attendance in the number of working days during the semester and that the candidates character has been satisfactory. If a candidate fails to secure 75% attendance and conduct has been satisfactory it shall be open to the Principal or any authority delegated such powers to grant exemption to a candidate for valid reasons subject to conditions.

**EXAMINATIONS**

The final Examinations shall be conducted at the end of each semester for the subjects of study undergone in that semester.

Practical Examinations will be conducted with one internal examiner and one external examiner. The question paper for practical examination will be jointly prepared by internal and external examiners. Record marks will be assigned by internal examiner.

**SESSIONAL MARKS**

Sessional marks will be awarded to the candidates for both theory and practical. For theory it will be based on two class tests, assignments and seminar. For practical it will be based on continuous lab assessments. During the sixth semester the students have to report the progress of their Project work on scheduled dates, to the department committee based on which marks shall be awarded by the project supervisor.

## **PASSING REQUIREMENTS**

1. Single valuation (External examiner) system is followed for correcting final theory examinations.
2. A candidate shall be declared to have passed the examinations in a subject if he/she secures not less than 50% of the total prescribed marks for the subject in Sessional and final examinations put together, subject to his/her getting a minimum of 50% of the marks in the semester examination.
3. A candidate who successfully completes the course and passes the examinations prescribed in all the subjects of study and practical examinations shall be declared to have been qualified for the degree.
4. If a candidate does not complete the course successfully within a period of 6 years (12 semesters) from the date of his/her joining, he/she will be disqualified from the course.
5. Candidates who have passed 75% with and more aggregate and have cleared all the papers in the first attempt be classified as First class with distinction.

## **CLASSIFICATION OF SUCCESSFUL CANDIDATES**

1. All candidates securing not less than 60% of the aggregate marks including sessionals shall be declared to have passed the Degree in **FIRST CLASS** provided they have passed the examination in every subject including practical, project work and Viva-Voce within three years of joining the course.
2. Other successful candidates shall be declared to have passed the examinations in **SECOND CLASS**.

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), COIMBATORE - 641 018**  
**DEPARTMENT OF COMPUTER APPLICATIONS**  
**M.C.A. – Scheme of Examinations: CBCS PATTERN**  
**(For the Students Admitted During the Academic Year 2018-2019 Onwards)**

Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	External Min.	Total Pass Mark	Credits
<b>Semester - I</b>								
18MCA11C	Computer Organization and Architecture	4	25	75	100	38	50	4
18MCA12C	Problem Solving and C Programming	4	25	75	100	38	50	4
18MCA13C	Data Structures	4	25	75	100	38	50	4
18MCA14C	Computer Networks	4	25	75	100	38	50	4
18MCA15C	Mathematical Foundation for Computer Science	4	25	75	100	38	50	4
18MCA16P	<b>Practical 1 : C Programming Lab</b>	5	40	60	100	30	50	3
18MCA17P	<b>Practical 2 : Data Structures Lab</b>	5	40	60	100	30	50	3
<b>Semester - II</b>								
18MCA21C	Operating Systems	4	25	75	100	38	50	4
18MCA22C	Relational Data Base Management System	4	25	75	100	38	50	4
18MCA23C	Object Oriented Programming and C++	4	25	75	100	38	50	4
18MCA24C	Software Quality Management	4	25	75	100	38	50	4
18MCA25C	Operations Research	4	25	75	100	38	50	4
18MCA26P	<b>Practical 3: RDBMS Lab</b>	5	40	60	100	30	50	3
18MCA27P	<b>Practical 4: C++ Programming Lab</b>	5	40	60	100	30	50	3
<b>Semester - III</b>								
18MCA31C	Python Programming	4	25	75	100	38	50	4
18MCA32C	Java Programming	4	25	75	100	38	50	4
18MCA33C	Mobile Computing	4	25	75	100	38	50	4
18MCA34C	Design and Analysis of Algorithms	4	25	75	100	38	50	4
18MCA35C	Accounting and Financial Management	4	25	75	100	38	50	4
18MCA36P	<b>Practical 5: Python Programming Lab</b>	5	40	60	100	30	50	3
18MCA37P	<b>Practical 6: Java Programming Lab</b>	5	40	60	100	30	50	3

Sub Code	Title of the Paper	Hrs (wk)	Internal (CA) Marks	External Marks	Total Marks	External Min.	Total Pass Mark	Credits
<b>Semester - IV</b>								
18MCA41C	Computer Graphics and Multimedia	4	25	75	100	38	50	5
18MCA42C	.NET Programming (C#)	4	25	75	100	38	50	4
18MCA43C	Cloud Computing	4	25	75	100	38	50	4
18MCA44E	<b>Elective 1:</b>	4	25	75	100	38	50	3
18MCA45E	<b>Elective 2:</b>	4	25	75	100	38	50	3
18MCA46P	<b>Practical 7: Computer Graphics and Multimedia Lab</b>	5	40	60	100	30	50	3
18MCA47P	<b>Practical 8: C# Programming Lab</b>	5	40	60	100	30	50	3
<b>Semester - V</b>								
18MCA51C	Cyber Security	4	25	75	100	38	50	5
18MCA52C	Data Mining and Big Data Analytics	4	25	75	100	38	50	4
18MCA53C	Principles of Marketing and Management	4	25	75	100	38	50	4
18MCA54E	<b>Elective 3:</b>	4	25	75	100	38	50	3
18MCA55E	<b>Elective 4:</b>	4	25	75	100	38	50	3
18MCA56P	<b>Practical 9 : Open Source Tools Lab</b>	5	40	60	100	30	50	3
18MCA57P	<b>Practical 10: Data Mining Lab</b>	5	40	60	100	30	50	3
<b>Semester - VI</b>								
18MCA61V	<b>Project and Viva Voce</b>		40	160	200	80	100	7
<b>Total Credits</b>								<b>135</b>

**GOVERNMENT ARTS COLLEGE (AUTONOMOUS), COIMBATORE - 641 018**  
**DEPARTMENT OF COMPUTER APPLICATIONS**  
**ELECTIVES FOR FOURTH & FIFTH SEMESTER**

**ELECTIVE – I**

- 1.1. Embedded Systems
- 1.2. Software Testing
- 1.3. Computer Forensics
- 1.4. Parallel Processing
- 1.5. Compiler Design

**ELECTIVE – II**

- 2.1. E-Commerce
- 2.2. Green Computing
- 2.3. TCP/IP
- 2.4. Service Oriented Architecture (SOA)
- 2.5. Grid Computing

**ELECTIVE – III**

- 3.1. Digital Image Processing
- 3.2. Bio Informatics
- 3.3. Pervasive Computing
- 3.4. Social Networking and Web Mining
- 3.5. Internet of Things

**ELECTIVE – IV**

- 4.1. Soft Computing
- 4.2. Programming for Robotics
- 4.3. Artificial Intelligence and Expert Systems
- 4.4. Wireless Sensors Networks
- 4.5. Open Source Tools

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	COMPUTER ORGANIZATION AND ARCHITECTURE	I	18MCA11C

**Objective:** To enable the students on completion of the course: - Understand the basic computer architecture, number system, I/O Registers and memory. To train the students to acquire skills in basic functions, principles and concepts of Computer architecture.

**UNIT I: Binary Systems:** Digital Computers and Digital systems - Binary Numbers – Number Base Conversions - Octal and Hexadecimal number -Complements -Binary codes.

**Boolean Algebra and Logic Gates** – Basic Definition- Axiomatic Definition of Boolean Algebra - Basic Theorems and Properties of Boolean Algebra – Boolean Functions - Canonical and Standard forms- Other Logic operations-Digital Logic Gates- Simplifications of Boolean Function.

**UNIT II: Combinational Logic:** Introduction- Design Procedure – Adders – Subtractors – Code Conversions - Multiplexer - Demultiplexer - Encoder - Decoder.

**SEQUENTIAL Logic:** Introduction - Flip-Flops - triggering Flip-flop - Excitation Tables - Registers – Shift registers – Ripple Counters - Synchronous counters – Timing Sequences.

**UNIT III: Register Transfer Logic:** Introduction -Arithmetic, Logic and Shift Micro-operations – Fixed Point Binary data - Arithmetic Shifts - Instruction Codes.

**Micro Computer System Design:** Introduction - Instructions and Addressing modes - Stack, Subroutines and Interrupt - Input – Output interface- Direct Memory Access.

**UNIT IV: CPU Organization:** General Register Organization Types of Interrupts – RISC - Parallel Processing – Pipelining – Array Processors- Performance of a processor.

**Input–Output Organization:** Peripheral Devices - Asynchronous Data Transfer (Strobe & Handshaking Method) – Modes of Transfer – Priority Interrupt – IOP.

**UNIT V: Memory Organization:** Types of Memory - Memory Hierarchy - Main Memory – Memory interface to CPU - Associative Memory - Cache Memory: Cache mapping schemes.Virtual Memory.

**TEXT BOOKS:**

1. Morris Mano M, “Digital Logic and Computer Design”, Pearson Education, 2016.
2. Morris Mano M, “Computer System Architecture”, Pearson Education, 2012.

**REFERENCE BOOKS:**

1. John Patrick Hayes, “Computer Architecture and Organization”, Tata McGraw Hill, 2007.
2. Albert Paul Malvino, Donald P. Leach, “Digital Principles and Applications”, Tata McGraw Hill, 2002.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	PROBLEM SOLVING AND C PROGRAMMING	I	18MCA12C

**Objective:** On Successful Completion of the Course the students should have understood Problem Solving Techniques and Programming in C using Loops, Arrays, Pointers, Structures and Files.

**UNIT I:** Planning the Computer Program – Flow Chart – Types of Logic used in Flowchart – Computer Languages – Hierarchy of Programming Languages – Classifications of Programming Languages – Program development process – Characteristics of a Good Program – Error in Programming.

**UNIT II:** An overview of C – Data types and sizes – Declarations – Variables – Constants – Operators – Expressions – Program Control Structures – Loop Control Structures – C Formatted Input / Output – Arrays – Strings

**UNIT III:** Function – Function Arguments – Function Prototype – Storage classes – Recursion – Structures – Unions – Bit Manipulations and Enumerations – Self-Referential Structures – Dynamic Memory Allocation.

**UNIT IV:** Pointers – Introduction – Pointers and Arrays – Pointers and Strings – Pointers and Structures – Pointers and Data structures.

**UNIT V:** Streams and files - command line arguments - C preprocessor - conditional computation directives - defining macros - standard library functions (including system functions) – I/O functions (Console, disk port I/O) – I/O redirection – bit fields - usage of inline assembly

**TEXT BOOKS:**

1. E.Balagurusamy, “Programming in ANSI C”, 3<sup>rd</sup> Edition, Tata McGraw Hill.
2. Yeshavant Kanetkar, “Let us C”, 4<sup>th</sup> Edition, BPB Publications, 2003.

**REFERENCE BOOKS:**

1. Ashok N.Kamthane. “Programming with ANSI and Turbo C”, Pearson Education Asia, 2003.
2. Deitel & Deitel, “C How to Program”, Third Edition, Pearson Education Asia.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	<b>DATA STRUCTURES</b>	<b>I</b>	<b>18MCA13C</b>

**Objective:** To enable the students on completion of the course: Understand the various Data Structures, Algorithms for sorting and searching. To train the students to acquire skills in data structure fundamentals, principles and concepts.

**UNIT I: Introduction:** Introduction: Algorithmic notation – Programming principles – Creating programs- Analyzing programs. Arrays: One dimensional array, multidimensional array, pointer arrays. Searching: Linear search, Binary Search, Fibonacci search.

**UNIT II:** Stacks: Primitive operations, Application of stacks. Queues: Primitive operations - Priority queues - Dequeues – Applications. Linked list: Singly Linked List, Doubly Linked List, Circular Linked List, Linked stacks, Linked queues, Applications of Linked List –Dynamic storage management.

**UNIT III:** Trees: Binary tree, Terminology, Representation, Traversal, Types, Applications. Graph: Terminology, Representation, Traversals – Applications - Spanning Trees, shortest path and Transitive closure, Topological sort. Sets: Representation - Operations on sets – Applications.

**UNIT IV:** Tables: Symbol tables - Hash tables. Sorting techniques: Internal and External sorting - Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, Radix Sort.

**UNIT IV:** Files: queries - Sequential organization – Index techniques. B Trees: B Tree indexing, operations on a B Tree, Lower and upper bounds of a B Tree - B + Tree Indexing – Trie Tree Indexing.

**TEXT BOOKS:**

1. Ellis Horowitz and Sartaj Sahni “Fundamentals of Data Structures” Galgotia Book Source, Pvt. Ltd., 2004.
2. D. Samanta, “Classic Data Structures”, Prentice-Hall of India, Pvt. Ltd., India 2003.
3. Robert Kruse, C.L. Tondo and Bruce Leung, “Data Structures and Program Design in C”, Prentice-Hall of India, Pvt. Ltd., Second edition, 2007.

**REFERENCE BOOKS:**

1. Jean Paul Tremblay and Paul G. Sorenson, “An Introduction to Data Structures with Applications”, Tata McGraw-Hill, Second edition, 2001.
2. Mark Allen Weiss,” Data Structures and Algorithm Analysis in C”, Pearson Education, Second edition, 2006.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	COMPUTER NETWORKS	I	18MCA14C

**Objective:** On Successful Completion of the Course the students should have learnt Network uses Hardware and Software of Networks, and uses of Network Layers and Protocols.

**UNIT I: Introduction:** Use of computer networks – Network Hardware – Network Software – Reference models – Example of networks.

**UNIT II: The Physical Layer:** The Theoretical basis for data communication – Guided transmission Media – Wireless transmission – Communication satellites – The Public switched Telephone network – Cable Television – Mobile telephone system.

**UNIT III: Data Link Layer:** Data link layer design issues – Error detection and correction – Elementary data link protocols – Sliding window protocols – Example data link Protocols.

**UNIT IV: Network Layer:** Network layer design issues – Routing algorithms – Congestion, Control algorithms – Quality of service – Internetworking – Network layer in the internet.

**UNIT V: Transport Layer:** The transport service – Elements of transport protocol – A simple transport protocol – The internet Transport Protocols: UDP – The Internet Transport Protocols: TCP.  
**Application Layer :** DNS- Electronic mail : The World Wide Web- Basics of Network Security.

**TEXT BOOKS:**

1. Andrew S. Tanenbaum, “Computer Networks”, 2012, Pearson Education,

**REFERENCE BOOKS:**

1. P. Green – Computer Network Architectures and Protocols, Plenum Press, 1982.
2. Harry Katzan – An Introduction to “Distributed Data Processing”, A Petrocelli Book, New York / Princeton.
3. Tittel – Theory and Problems of Computer Networking, Schaum’s outline series, TMH.
4. Godbole – Data Communication & Networking, TMH.
5. Leon Garcia – Communication Networks: Fundamental Concepts & Key Architecture, TMH.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	<b>MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE</b>	<b>I</b>	<b>18MCA15C</b>

**Objective:** On successful completion of the course the students should have understood the concepts of discrete maths, vector algebra and numerical methods.

**UNIT I: Mathematical Logic:** Introduction – Statements and Notation – Connectives - Negation – Conjunction – Disjunction – Statement Formulas and Truth Tables – Conditional and Biconditional - Tautology - Equivalence of formulas – Duality Law Tautological Implications - Normal forms - Disjunctive Normal Forms - Conjunctive Normal Forms - Principal Disjunctive Normal Forms - Principal Conjunctive Normal Forms. (Chapter1 - Sections: 1.1 to 1.2 - 1.2.1 to 1.2.4, 1.2.6, 1.2.8 to 1.2.11, 1.3 - 1.3.1 to 1.3.4)

**UNIT II: Theory of Inference for Statement Calculus and Predicate Calculus:** Validity using Truth tables – Rules of Inference – Consistency of Premises and Indirect Method of proof – The Predicate Calculus – Predicates – The statement Function, Variables and Quantifiers – Predicate Formulas – Free and Bound Variables – Theory of Inference for the predicate calculus. (Chapter 1 - Sections: 1.4 - 1.4.1 to 1.4.3, 1.5 – 1.5.1 to 1.5.4, 1.6 – 1.6.4)

**UNIT III: Vector Algebra:** Definition – Addition and subtraction of vectors – Position vector – Composition of vectors – Rectangular unit vectors – Vector product – Scalar product – Cross product – Scalar triple product – Vector triple product. (Chapter 8 - Sections 1 to 8).

**UNIT IV: The Solution of Numerical Algebraic and Transcendental Equations:** Bisection method - Iteration method - Regula falsi method - Newton-Raphson method. (Chapter 3 - Sections: 3.1 to 3.4)

**UNIT V: Solution of Simultaneous Linear Algebraic Equations:** Direct method - Gauss elimination method - Gauss Jordan method. Indirect method -:Gauss Jacobi method - Gauss Seidel method of iteration. (Chapter 4 - Sections: 4.1, 4.2, and 4.7 to 4.9)

**TEXT BOOKS:**

1. **Discrete Mathematical Structures With Applications To Computer Science** - J.P.TREMBLAY AND R.MANO HAR, Tata McGraw Hill Publishing Company Limited, 38<sup>th</sup> Reprint 2010. (For Units I and II).

2. **Ancillary Mathematics - VOL II** – S.NARAYANAN, R.HANUMANTHA RAO and T.K.MANICAVACHAGAM PILLAY, S.VISWANATHAN Printers and Publishers PVT Ltd, 2011 – 2013. **(For Unit III).**
3. **Numerical Methods** - K.P.KANDASAMY, Dr. K.THILAGAVATHY and Dr. K.GUNAVATHY, S. Chand and Company Limited, New Delhi, Reprint 2002. **(For Units IV and V).**

**REFERENCE BOOKS:**

1. **Discrete Mathematics With Graph Theory And Combinatorics** - T. VEERARAJAN, Tata McGraw Hill Publishing Company, New Delhi, Fifth Reprint, 2008.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 1: C PROGRAMMING LAB	I	18MCA16P

**Objective:** On Successful Completion of the Course the students should have understood Developing Programs in C.

1. Programs using Arrays.
2. Programs using Control Structures.
3. Programs using Functions, using Call by Value, and Call by Reference.
4. Programs using Recursion.
5. Programs using Dynamic Memory Allocation.
6. Programs using Structure.
7. Programs to Access the Array Element using Pointers.
8. Programs using File.
9. Programs using Functions with Pointers.
10. Programs using Command Line Arguments.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 2: DATA STRUCTURES LAB	I	18MCA17P

**Objective:** To implement the data structure concepts using C language.

1. Implementation of Stack
2. Implementation of Queue
3. Implementation of Single Linked List.
4. Implementation of Double Linked List
5. Implementation of Binary Search.
6. Implementation of Bubble Sort,
7. Implementation of Quick Sort
8. Implementation of Merge Sort
9. Conversion of Infix Expression to Postfix Expression
10. Implementation of Graph Traverses Using Depth First Search

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	OPERATING SYSTEMS	II	18MCA21C

**Objective:** On Successful Completion of the Course the students should have understood Operating System Functions like Processes, Memory, File and Database Management and Case Study of Linux OS.

**UNIT I:** Introduction – What is an OS – Mainframe systems – Desktop systems – Multiprocessor systems – Distributed systems – Clustered systems – Real-Time systems. Operating system structures: Systems components – OS services – System calls – System Programs – Systems structure – Virtual machines - System Design & Implementation – System Generation.

**UNIT II:** Process Management: Process concept – Process scheduling – Operations on process – Cooperating process – Inter-process communication. CPU scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor Scheduling – Real-Time Scheduling. Deadlocks: Deadlock characterization – Methods for handling Deadlocks – Deadlocks prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlock.

**UNIT III:** Memory Management: Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual memory: Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing

**UNIT IV:** I/O Systems: Disk structure – Disk scheduling – Disk management – Swap – Space management. File systems: File concept – Access methods Directory structure – File system structure – File system implementation – Directory implementation – Allocation methods – Free space management.

**UNIT V:** CASE STUDY: Linux: Design Principles – Kernal modules – Process management, scheduling – Memory management – File systems – Input & Output – Interprocess Communication – Network structure – Security.

**TEXT BOOKS:**

1. Silberschatz, Galvin, Gagne, Operating Systems Concepts, Sixth Edition, John Wiley & Sons, 2013.

**REFERENCE BOOKS:**

1. Tanenburn, “Operating systems: Design & Implementation”, PHI, Second Edition, 1998.
2. Deital, “Operating Systems”, Pearson Education Asia, Second Edition, 2001.
3. D.M.Dhamdhare, “System Programming and Operating Systems”, TMH, 2000.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	RELATIONAL DATA BASE MANAGEMENT SYSTEM	II	18MCA22C

**Objective:** To motivate and enable the students in knowing about the concepts of database systems, model and its architecture.

**UNIT I:** Introduction - Database system applications - purpose of database system – View of data – Database Languages – Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture – Database Users and Administrators.

**UNIT II:** Relational Databases – Relational Model – Structure of Relational Databases – Fundamental Relational Algebra Operations – Additional Relational Algebra Operations. SQL – Background – Data Definition – Basic Structure of SQL Queries – Set Operations – Aggregate Functions – Null values – Nested Subqueries – Views – Modification of the Database.

**UNIT III:** Database design : Database Design and the E – R Model – Design Phases – Design Alternatives – The Entity Relationship Model – Constraints – Entity Relationship Diagrams – Extended E – R features – Specialization – Generalization – Aggregation – Reduction to Relational Schemas.

**UNIT IV:** Relational Database Design – Features of Good Relational Designs – Atomic Domains and First Normal Form – Decomposition using Functional Dependencies – Keys and Functional Dependencies – Boyce – Codd Normal Form – BCNF and Dependency Preservation – Third Normal Form – Functional Dependency Theory – Lossless Decomposition – Dependency Preservation – BCNF Decomposition Algorithm – 3NF Decomposition – Multivalued Dependencies – Fourth Normal Form – 4NF Decomposition.

**UNIT V:** Database System Architectures – Centralized and Client / Server Architectures – Centralized Systems – Client / Server Systems – Server System Architectures – Parallel Systems – Distributed Systems – Network Systems.

**TEXT BOOKS:**

1. Database System Concepts “ by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Fifth edition, 2006, Mc Graw Hill International Edition.

**REFERENCE BOOKS:**

1. “An Introduction to Database Systems “by Bipin c. Desai, West Publishing Company, 1990.
2. “ Database Management Systems” by Elmasri and Navathe.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	OBJECT ORIENTED PROGRAMMING AND C++	II	18MCA23C

**Objective:** On Successful Completion of the Course the students should have understood Object Oriented Programming Concepts and how to Code C++ Programs using Constructors, Overloading, Inheritance and Files.

**UNIT I: Principles of Object Oriented Programming:** Software Crisis – Software Evolution – Procedure Oriented Programming – Object Oriented Programming Paradigm – Basic concepts and benefits of OOP – Object Oriented Language – Application of OOP – Structure of C++ – Applications of C++ – Tokens, Expressions and Control Structures - Operators in C++ – Manipulators.

**UNIT II: Functions in C++:** Function Prototyping – Call by reference – Return by reference – Inline functions – Default, const arguments – Function Overloading – Friend and Virtual Functions.

**Classes and Objects:** – Member functions – Nesting of member functions – Private member functions – Memory Allocation for Objects – Static Data Members – Static Member functions – Array of Objects – Objects as function arguments – Friendly functions – Returning objects – const member functions – Pointer to members.

**UNIT III: Constructors:** Parameterized Constructors – Multiple Constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy and Dynamic Constructors – Destructors. **Operator Overloading:** Overloading unary and binary operators – Overloading binary operators using friend functions- Overloading the extraction and the insertion operators.

**UNIT IV: Inheritance:** Defining derived classes – Single Inheritance – Making a private member inheritable – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance – Virtual base classes – Abstract classes – Constructors in derived classes – Member classes – Nesting of classes.

**UNIT V: Streams:** String I/O – Character I/O – Object I/O – I/O with multiple objects – File pointers – Disk I/O with member functions. Exception handling – Templates – Redirection – Command line arguments.

**TEXT BOOKS:**

1. E.Balagurusamy, “Object Oriented Programming With C++”, 6<sup>th</sup> Edition, Galgotia, Publications Pvt. Ltd., 2000.

**REFERENCE BOOKS:**

1. Herbert Schildt, C++: The Complete Reference, McGraw Hill Inc., 1997.
3. Stanley B. Lippman, Inside the C++ Object Model, Addison Wesley, 1996.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	SOFTWARE QUALITY MANAGEMENT	II	18MCA24C

**Objective:** To motivate the students as well to enrich their knowledge about the concepts of software configuration and testing.

**UNIT I: Introduction:** Software Process assessment overview - Assessment phases - Assessment principles - Assessment conduct -Implementation consideration - Quality management - Quality assurance plan - Considerations – Verification and Validation.

**UNIT II: Configuration Management:** Need for configuration Management - Software product nomenclature - configuration management functions - Baselines - Responsibilities - Need for automated tools - plan – SCM support functions - The requirement phase Design control - The implementation phase - Test phase - SCM Tools - Configuration accounting and audit.

**UNIT III: Software Standards And Inspection:** Definitions - Reason for software standards - Benefits - Establishing standards - Guidelines - Types of reviews - Inspection of objectives - Basic inspection principles - The conduct of inspection - Inspection training.

**UNIT IV : Testing and Managing Software Quality:** Testing: principles - Types - Planning - Development - Execution and reporting – Tools and methods - Real Time testing - quality management paradigm - Quality motivation – Measurement criteria - Establishing a software quality program - Estimating software quality.

**UNIT V: Defect Prevention** Principles of software defect prevention - Process changes for defect prevention - Defect prevention considerations - Managements role - Framework for software process change - Managing resistance to software process change - Case studies.

**TEXT BOOKS:**

1. Watts S. Humphrey, Managing the software process, Addison Wesley, 1999.

**REFERENCE BOOKS:**

1. Tsum S.Chow, Software Quality Assurance a Practical Approach, IEEE Computer Society Press, 1985.
2. Richard E. Fairley, Software Engineering - A Practitioner’s approach, McGraw Hill, 1982.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	<b>OPERATIONS RESEARCH</b>	<b>II</b>	<b>18MCA25C</b>

**Objective:** On successful completion of the course the students should have understood linear programming and network methods analysis methods.

**UNIT I:** Linear Programming Problem – Formulation of L.P.P – Graphical solutions of L.P.P – Simplex Method. Charnes Penalty Method (or) Big – M Method – Duality in L.P.P – Primal and Dual Problems. (Chapter 2 - Sections:2.1 to 2.4; Chapter 3 - Sections: 3.1 and 3.2; Chapter 4 - Sections:4.1 to 4.4;Chapter 5 - Section :5.1 to 5.4)

**UNIT II:** The Transportation Problems – Basic feasible solution by LCM – NWC – VAM – Optimum solutions – Unbalanced- Transportation problems. The Assignment problems – Introduction – Mathematical formulation – Hungarian assignment method. (Chapter 10 - Sections:10.1 to 10.10, 10.13 ; Chapter 11 - Sections: 11.1 to 11.3)

**UNIT III: Replacement Model:** Introduction – Replacement of items that deteriorates gradually- value of money does not change with time - value of money changes with time - Replacement of items that fails suddenly. Individual Replacement- Group replacement. (Chapter 18 - Sections: 18.1 to 18.3)

**UNIT IV: Network Scheduling By PERT/CPM** – Introduction - Network and basic component - Rules of network construction – time calculation in Networks - CPM. PERT - PERT calculations. (Chapter 25 - Sections: 25.1 to 25.8)

**UNIT V: Queuing Theory:** Introduction- Characteristics of Queuing system- Problems from single server:finite and infinite population model-Problems from multi server:finite and infinite Population model. (Chapter 21 - Sections: 21.1 to 21.9)

**TEXT BOOKS:**

- 1. Operations Research - Kandiswarup, P.K. Gupta and Man Mohan, S. CHAND & Sons** education Publications, New Delhi, Fourteen Revised Edition. Reprint 2009

**REFERENCE BOOKS:**

1. **Operations Research-An Introduction** – HAMDY A.TAHA, Seventh Edition, Pearson Education, Reprint 2005.
2. **Introduction To Operations Research** - FREDRICK S.HILLIER GERALD J.LIEBERMAN, Seventh Edition, Tata McGraw Hill Publishing Company Limited, Reprint 2001.
3. **Operations Research Theory and Applications-** J.K.SHARMA Macmillan India Limited, Second Edition, Reprint 2003.
4. **Problems In Operations Research** – P.K.GUPTA AND D.S.HIRA, Third Edition, S. Chand and Company Limited, Reprint 2005

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 3: RDBMS LAB	II	18MCA26P

**Objective:** To enable the students in knowing the concepts of SQL queries and PL/SQL procedures.

**LIST OF PRACTICALS (Use Oracle SQL queries and PL/SQL procedures)**

1. Banking Automation for various schemes
2. Online reservation system
3. Student database
4. Student mark processing system
5. Hotel management
6. Stock maintenance
7. College admission system
8. Library management system
9. Payroll processing system
10. Automatic backup and recovery of files

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	<b>Practical 4: C++ PROGRAMMING LAB</b>	<b>II</b>	<b>18MCA27P</b>

**Objective:** On Successful Completion of the Course the students should have:

1. C++ Program using operator overloading functions.
2. C++ Program using Function Overloading.
3. C++ Program using Default Arguments.
4. C++ Program using Functions with Call by Value.
5. C++ Program using Functions with Call by Reference.
6. C++ Program using Constructors and Destructors.
7. C++ Program using Exception Handling.
8. C++ Program using Type Conversion.
9. C++ Program using String Manipulation Functions.
10. C++ Program using Friend Functions.
11. C++ Program using Inheritance.
12. C++ Program using Files.
13. C++ Program using Pointers.
14. C++ Program using Templates

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	PYTHON PROGRAMMING	III	18MCA31C

**Objective:** On Successful Completion of the Course the students should have understood Functions, String, Lists, Tuples, Exceptions Classes and Objects in Python.

**UNIT I: Introduction to Python:** Python Overview - Getting Started with Python - Python Identifiers - Reserved Keywords – Variables - Standard Data Types - Operators. Statement and Expression - String Operations- Boolean Expressions - Control Statements – Iteration - while Statement - Input.

**UNIT II: Functions:** Introduction -Built-in Functions - Composition of Functions - User Defined Functions - Parameters and Arguments - Function Calls. The Return Statement - Python Recursive Function - The Anonymous Functions - Writing Python Scripts.

**Unit III: Strings:** Strings - Compound data types - len function - String slices - String traversal - String formatting operators and functions. **Lists:** Values and accessing elements - lists are mutable – Traversing and deleting elements – Built-in operators and methods.

**Unit IV: Tuples:** Creating tuples-accessing values - tuples assignment - tuples as return values - variable length argument tuples - basic tuple operations - built-in tuple functions. **Dictionaries:** Creating and accessing a dictionary - updating and deleting - properties of dictionary keys - operations and built-in dictionary methods. **Exceptions:** Exceptions with Arguments - User-Defined Exceptions.

**Unit V: Classes and Objects:** Overview of OOP (Object-Oriented Programming)- Class Definitions - Creating Objects-Objects as Arguments - Objects as Return Values - Built-in Class Attributes – Inheritance - Method Overloading.

**TEXT BOOKS:**

1. **E.Balagurusamy**, "Introduction To Computing And Problem Solving Using Python", McGraw Hill Education Private Limited, New Delhi

**REFERENCE BOOKS:**

1. **Mark Lutz, David Ascher**, "Learning Python", Shroff Publishers & Distributors Private Limited,2009.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	<b>JAVA PROGRAMMING</b>	<b>III</b>	<b>18MCA32C</b>

**Objective:** On successful completion of the course the students should have understood the Basic concept and fundamentals of core java classes, API, OOPS concept in Java and features of OOPS.

**UNIT I:** The Genesis of Java – The Java class Libraries – Data types, Variables – Operators – Arrays. Control Statements: Selection statements – Iteration statements – Jump statements. Introducing classes: Class Fundamentals – Declaring objects – Methods.

**UNIT II:** Constructors – this keyword – Garbage collection. Overloading Methods – Access controls – Nested and Inner classes. Inheritance: Inheritance basics – using Super - Method overriding – Dynamic method Dispatch – Abstract classes - using final with inheritance. Packages and Interfaces: Packages - Access protection – Importing Packages – Interfaces.

**UNIT III:** Exception Handling: Exception Handling Fundamentals – Java’s Built in Exceptions – creating own Exception subclasses. Multithreaded Programming: The Java Thread Model – Creating a Thread – Synchronization – Inter Thread communication.

**UNIT IV:** I/O Basics – Reading console Input –Writing Console Output – Reading and writing Files – Exploring java.io. Applet Fundamentals – Applet Basics – Introducing the AWT.

**UNIT V:** Software Development using Java: Java Beans introduction - Servlets: Life cycle – A simple servlet – servlet API – Handling HTTP Request and Responses – Session tracking. Networking Basics – Remote Method Invocation (RMI) – Accessing Database with JDBC.

**TEXT BOOKS:**

1. Herbert Schildt, “The Complete Reference Java 2”, 2<sup>nd</sup> Ed, Tata McGraw Hill (I) Pvt. Ltd.,2002
2. H.M. Deitel and P. J. Deitel, “Java How to Program”, 6<sup>th</sup> Ed, PHI/Pearson Education Asia 2005

**REFERENCES BOOKS:**

1. Keyur shab , “**Java 2 Programming**”, Tata McGraw-Hill pub. Company Ltd.
2. C.Xavier, “**Programming with Java 2**”, SciTech Publications (India) Pvt. Ltd.
3. Cays S.Horstmann, GaryCornell,“**Core Java2 Volume I- Fundamentals**”, PersonEdition, 2001.
4. Cays S. Horstmann, Gary Cornell, “**Core Java2 Volume II – Fundamentals**”, Person Edition, 2003.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	MOBILE COMPUTING	III	18MCA33C

**Objective:** The course presents the concepts of Mobile Computing. To enable the students to learn the basics of mobile communication systems and mobile networks and application development.

**UNIT I: Introduction:** Introduction to networking - Advantages and disadvantages of wireless networking - Evolution of mobile communication generations – Wireless LAN and Wireless WAN - Mobile devices Profiles.

**UNIT II: Cellular Concept:** Wireless transmission - Frequencies for radio transmission - Regulations - Signals, Signal propagation, Path loss of radio signals, Additional signal propagation effects - Multi-path propagation - Multiplexing – Cellular Systems – Frequency Reuse – Problems with MAC in cellular systems – MACA – CDMA.

**UNIT III: Mobile Network Infrastructure:** GSM - Mobile services - System architecture - Handover – GPRS – Mobile services – System Architecture – WAP protocol stack – WAE – Blue Tooth – Piconet, scatternet.

**UNIT IV: Mobile Applications Architecture:** Wireless Internet – Wireless Internet Architecture – Smart Client – Smart Client Architecture – Messaging Architecture – Sample Applications – Characteristics and benefits – Application Model - Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools.

**UNIT V: Application Development:** Overview of Android – Devices Running Android – Why for Android – Features of Android – Architecture, Libraries – SDK – Views and View groups – layouts – Menus - Intents and services – Adapters – Using Internet Resources – Dialogs – Capturing Date and Time – Validation – File System in android – File management - Developing Location based applications – Creating map based activities - Packaging and Deployment - Security and Hacking

**TEXT BOOKS:**

1. Martyn Mallick, “Mobile and Wireless design essentials” Wiley Publishing Inc, 2008.
2. Jochen Schiller, “Mobile Communications”, Addison-Wesley, 2003.
3. Reto Meier and Wrox Wiley, “Professional Android 2 Application Development”, 2010.

**REFERENCE BOOKS:**

1. Zigurd Mednieks, Laird Dornin G, Blake Meike and Masumi Nakamura, “Programming Android”, O’Reilly, 2011.
2. Hansmann, Merk, Nicklous and Stober, “Principles of Mobile Computing”, Springer, 2003.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	DESIGN AND ANALYSIS OF ALGORITHMS	III	18MCA34C

**Objective:** To motivate the students and to impart the knowledge about the algorithms and various techniques in problem solving.

**UNIT I:** Algorithm Specification –Recursive Algorithms – Performance Analysis – Space Complexity – Time Complexity -Asymptotic Notations – Asymptotic Complexity of SUM and Recursive SUM and ADD Algorithms - Analysis of Sequential Search.

**UNIT II:** Elementary Data Structures- Stacks and Queues – Trees – Binary Trees – Binary Search Trees – Iterative and Recursive Search of BST – Graphs – Konigsberg Bridge Problem – Graph Representations - Graph Traversals

**UNIT III:** Divide and Conquer: General Method – Binary Search – Finding Maximum and Minimum – Merge Sort – Greedy Algorithms: General Method – Container Loading – Knapsack Problem.

**UNIT IV:** Dynamic Programming: General Method – Multistage Graphs – All-Pair shortest paths – Optimal binary search trees – 0/1 Knapsack – Travelling salesperson problem .

**UNIT V:** Backtracking: General Method – 8 Queens problem – sum of subsets – graph coloring – Hamiltonian problem – knapsack problem.

**TEXT BOOKS:**

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithm, Galgotia Publications, 2007.

**REFERENCE BOOKS:**

1. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", Second Edition, Prentice Hall of India Pvt. Ltd, 2003.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and analysis of Computer Algorithms", Pearson Education, 1999.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	ACCOUNTING AND FINANCIAL MANAGEMENT	III	18MCA35C

**Objectives** To provide the necessary basic Accounting concepts for the students, so as to manage the Financing decisions and Financial Management functions. To develop the ability to analyze and communicate the quantitative and qualitative information in making more effective planning and control decisions.

**UNIT I: Financial Accounting:** Meaning and Definition – Objectives - Advantages – Accounting Concepts and Conventions – Single entry system and Double entry system – Basic books of accounts – Journal – Ledger – Trial balance – Final Accounts – Trading , Profit and loss account and Balance Sheet - Preparation of Final Statement of Accounts of sole proprietary concern.

**UNIT II: Cost Accounting:** Meaning and Definition- Nature and Scope – Importance – Advantages and Limitations of Cost Accounting – Classifications of costing - Elements of cost – Preparation of cost sheet - Marginal Costing: Meaning – Advantages – Cost Volume Profit Analysis (CVP)– Break Even Analysis – Applications of Marginal Costing.

**UNIT III: Management Accounting:** Meaning and Definition - Budgetary Control System: Meaning and Definition – Objectives – Advantages and Limitations – Preparation of cash and flexible of Budget – Ratio Analysis – Meaning and Types of Ratios – Advantages and Limitations.

**UNIT IV: Financial Management:** Meaning and Definition – Objectives – Financing Decisions - Functions of Financial Manager – Financial Statement Analysis –Advantages and Limitations - Comparative Statement – Common size statement – Trend Analysis.

**UNIT V: Computerized Accounting System:** Coding – Master file – Transaction file – Documents used for data collection – Processing of Different files and output obtained – Various types of Accounting software packages.

**TEXT BOOKS:**

1. R. L. Gupta and Radhaswamy “ Financial Accounting” Sultan Chand & Co.
2. S. N. Maheswari, “Cost and Management Accounting”, Sultan Chand & Co.
3. Sharma and Gupta, 'Financial Management" Kalyani Publishers.

**REFERENCE BOOKS:**

1. R. Narayanaswamy. “Financial Accounting – A Managerial Perspective, PHI Learning, New Delhi, 2008.
2. Jan William , “Financial & Managerial Accounting – The Basis for Business Decisions”, 13<sup>th</sup> Edition, Tata Mc Graw Hill Publishers, 2005.
3. Sighvi Bodhanwala, “Management Accounting” – Text and cases, PHI Learning , 2008.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 5: PYTHON PROGRAMMING LAB	III	18MCA36P

**Objective:** On Successful Completion of the Course the students should have learnt to Program in Python Using Lists, Tuples, Dictionaries and Classes.

1. Develop Python Program Using Strings.
2. Develop Python Program Using Functions.
3. Develop Python Program Using Python Scripts.
4. Develop Python Program Using Lists.
5. Develop Python Program Using Tuples.
6. Develop Python Program Using Dictionaries.
7. Develop Python Program Using Exceptions.
8. Develop Python Program Using Classes and Objects.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 6: JAVA PROGRAMMING LAB	III	18MCA37P

**Objective:** To implement the Java Programming concepts using JAVA language.

**1) Write Java Applications for the following:**

- a. Reverse and sum of individual digits of a given number (while, do..while and for loops)
- b. Arranging numbers in Ascending and Descending order (One Dimensional Array)
- c. Matrix Manipulation (Two Dimensional Arrays with switch statement)

**2) Classes and Objects**

- a. Write a Java application for finding the area and perimeter of a Rectangle (Class)
- b. Write a Java application for Pay-roll preparation. (Array of Objects)

**3) Inheritance**

- a. Write a Java application to implement inheritance concept

**4) Interfaces and Packages**

- a. Define an interface Area to find the area of the circle, area of the Rectangle and area of the Triangle
- b. Prepare an Electricity Bill using the package concept.

**5) String Handling**

- a. Write a program to test the methods in String and String Buffer classes
- b. Write a program for arranging the given names in Alphabetical order

**6) Files and I/O Streams**

- a. Write java programs using stream for
  - i. Displaying contents of the file
  - ii. Copying files
  - iii. Updating files

**7) Multi-Threading Programs using**

- a. Thread Class
- b. Runnable Interface
- c. Methods in the Thread Class

**8) Networking**

- a. Write a server and client programs for sending and receiving text messages using
  - i. Server Socket and Socket classes
  - ii. Datagram Sockets

**9) Exception Handling**

- a. Write a Java program to implement built-in exceptions
- b. Write a Java program to implement user-defined exceptions

**10) Swings**

- a. Write a Swing program to implement GUI components interactions with Event Handling

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	COMPUTER GRAPHICS AND MULTIMEDIA	IV	18MCA41C

**Objective:** On successful completion of the course the students should understand the Computer Graphics and the various graphic algorithms, 2D and 3D transformations, models and surface rendering, To enable the students to learn basic multimedia concepts such as audio, video and digital.

**UNIT I: Basics & Two-Dimensional Concepts:** Overview of Graphics Systems - Output primitives: Points and Lines – Line Drawing Algorithms – Circle generating Algorithms – Ellipse generating Algorithms – Two Dimensional Geometric Transformations: Basic Transformations, Matrix Representations, Composite Transformations – Two Dimensional Viewing: Line Clipping – Cohen-Sutherland algorithm.

**UNIT II: Three-Dimensional Concepts:** Three Dimensional Concepts, Three Dimensional Object Representations: Polygon Surfaces – Curved Lines and Surfaces – Quadric Surfaces – Spline Representation – Three Dimensional Geometric and Modeling Transformations – Three Dimensional Viewing, Viewing Pipeline, Projections – Clipping. (Chapters 9, 10, 11 & 12).

**UNIT III: Visible Surface Detection Methods & Color Models:** Visible Surface Detection Methods: Classification of Visible – Surface Detection Algorithms- Depth – Buffer Method, Scan line Method, BSP-Tree Method – Color Models and Color Applications.

**UNIT IV: Fundamentals Of Multimedia:** Multimedia-Overview – digital representation – text – image – audio – video.

**UNIT V: Multimedia Architecture & Virtual Reality:** Animation – compression – multimedia architecture – multimedia documents – multimedia application development – virtual reality.

**TEXT BOOKS:**

1. Donald Hearn & M. Pauline Baker, “Computer Graphics - C version” Second Edition, Pearson Education, 2006.
2. Ranjan Parekh, “Principles of Multimedia”, Tata McGraw Hill Publications, 2008

**REFERENCE BOOKS:**

1. Foley James D., Vandam Andries and Hughes John F., "Computer Graphics : Principles and Practice", Pearson Education, 2013.
2. Ralf Steinmetz, Klara Steinmetz , “Multimedia Computing , Communications and Applications”, Pearson Education, 2012.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	.NET PROGRAMMING (C#)	IV	18MCA42C

**Objective:** To provide good understanding of the role of Web Development using .net with C#. After the successful completion of the course the students should have the thorough knowledge on Web development.

**UNIT I: Introduction To .NET and C#:** Common Language Runtime, .NET frame work, Microsoft Intermediate Languages, Jitters, Unmanaged code. Evolution of C#, Characteristics of C#, How does C# differ from C++ and Java, Data types, Variables and Literals, Boxing and unboxing, Operators and Expressions, Type conversions, Mathematical functions, Decision making and branching, Decision making and looping.

**UNIT II: Object Oriented Programming In C#:** Methods, Classes and objects, access specifier, Inheritance, abstract class, sealed classes, interfaces, delegates, namespaces, exceptions.

**UNIT III: Advanced Features Of C#:** Serializing objects, deserialization, XML based serialization, Multi-threading, Reflection Attributes, Properties and Indexers.

**UNIT IV: Window Based Programming:** Win Forms, Textbox, Buttons, Message Box, List Box, Handling events.

**UNIT V: ADO .NET:** ADO.Net Object Model - Connecting with database, retrieving results, updating data in database, Deletion.

**ASP.NET Using C#:** Web Application Project, Web Forms, Controls.

**TEXT BOOKS:**

1. E. Balagurusamy, "Programming in C#" TMH, 2006.
2. Ian Griffiths, Matthew Adams and Jesse Liberty, "Programming C# 4.0" O'Reilly Sixth Edition.

**REFERENCE BOOKS:**

1. Stanley B.Lippman, "C# Primer A Practical Approach", Pearson Education, 2002.
2. Tom archer, "Inside C#", Microsoft Press, 2001.
- 3."Microsoft C# Language Specification", Microsoft Press, 2001.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	CLOUD COMPUTING	IV	18MCA43C

**Objective:** On Successful Completion of the Course the students should have understood Cloud Computing Fundamentals and Technologies, and Amazon EC3.

**UNIT I: Introduction:** Cloud computing in a nutshell, Layers and types, Features, Deployment models, Challenges and tasks, Migration into a cloud.

**UNIT II: Cloud Services:** Web based applications, Pros and Cons of cloud services: Platform as a service- Infrastructure as a service – service - software as a service, Discovering cloud services, development services and tools, cloud maturity levels, cloudsm

**UNIT III: Virtual Machines:** Provisioning and manageability, migration, provisioning in the cloud context, Management of VM Anatomy of cloud infrastructures - Scheduling techniques.

**UNIT IV: Map Reduce Paradigms:** Introduction, GFS Architecture, HDFS Architecture, Hbase, Google big Tables, Amazon’s key value pair storage and Microsoft’s Azure infrastructure, Map reduce programming model and implementations.

**UNIT V: Monitoring And Management:** Federated cloud computing, SLA Management: Types – Lifecycle - Automated policy management in cloud. **Cloud Computing Framework:** Amazon EC3, S3 storage services, Aneka framework, Google App Engine, Eucalyplus cloud computing platform, IBM Bluemix.

**TEXT BOOKS:**

1. Rajkumar Buyya, James Broberg and Andrzej Goscinskj, “Cloud Computing: Principles and Paradigms”, John Willey and Sons, New Delhi, 2011.

**REFERENCE BOOKS**

1. Judith Hurwitz, Marcia Kaufman, Fern Halper and Daniel Kirsch, “Hybrid Cloud for Dummies”, Wiley Publications, New Delhi, 2012.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	<b>Practical 7: COMPUTER GRAPHICS AND MULTIMEDIA LAB</b>	<b>IV</b>	<b>18MCA46P</b>

**Objectives:** Study features of Borland Turbo C++ and implementation of Graphics algorithms

**Computer Graphics:**

1. To implement Bresenham's algorithms for line.
2. To implement Bresenham's algorithms for circle.
3. To implement Bresenham's algorithms ellipse drawing.
4. To perform 2D Transformations such as translation, rotation, scaling, reflection and shearing.
5. To implement Cohen-Sutherland 2D clipping and window-viewport mapping.
6. To perform 3D Transformations such as translation, rotation and scaling.
7. To implement reflection.
8. To implement shearing.
9. To visualize projections of 3D images.
10. To convert between color models.

**Objectives:** Study features of Multimedia tools and its Applications.

**Multimedia:**

1. Still Image Editing using Photoshop.
2. Audio Editing.
3. Video Editing.
4. Animation Using 3D-Max.
5. Flash – Static, Action Scripts with Animation.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 8: C# PROGRAMMING LAB	IV	18MCA47P

**Objective:** To implement the .NET C# Programming concepts using C# language.

1. Generate Fibonacci series
2. Find the area of square, triangle, and rectangle.
3. Calculate  $nCr$  and  $nPr$  values.
4. Find the area and circumference of circle
5. Convert dollar to rupee, rupee to dollar.
6. Student details using inheritance.
7. Sales bill preparation using interface.
8. Display clock time using delegates and events.
9. Arithmetic operations
10. Passing values from one form to another form.
11. Calculator.
12. Insert record using data grid view.
13. Create user login form.
14. Cutoff mark calculation.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	CYBER SECURITY	V	18MCA51C

**Objective:** On Successful Completion of the Course the students should have understood Security in Computing, the concepts of Information Security and Cyber law

**UNIT I: Threats to Information Security:** What is information Security – Common threats. **The structure of an Information Security Program:** Overview – Business Unit Responsibilities - awareness program – Program Infrastructure (Chapter 2 & 3)

**UNIT II: Information Security Policies:** Policy is the corner stone- why implement an information security policy – corporate policies – Organization wide (Tier1) policies – Policy document – Legal requirements – Business requirements – Definitions – Policy key elements – Policy formats (Chapter 4)

**UNIT III: Asset Classification:** Introduction – overview – Why classify information – What is information classification – where to begin – Category examples – urge to add the categories – Constitution of confidential information – Employee responsibilities – classification examples – Declassification of information – Records management Policy- Information handling standards matrix – Information classification Methodology – Authorization for access. (Chapter 5)

**UNIT IV: Access Control:** Business requirements for Access control – User Access Management – System and network access control – Operating system access control – Monitoring access control – Cryptography. **Physical Security:** Data centre requirement – Physical access control – Fire prevention and detection – Verified disposal of documents – Agreements – Intrusion Detection Systems. (Chapter 6 & 7)

**UNIT V: Information Security and Cyber Law:** Introduction – Objectives – Intellectual property rights – Strategies for cyber security – Policies to mitigate cyber risk – Network security – IT Act – Signatures – Offence and penalties.

**TEXT BOOKS:**

1. Thomas R. Peltier Justin Peltier , John Blackley , “Information Security and Fundamentals”, Auer bach Publications.
2. “Information Security and Cyber Law”, tutorials point simply easy learning, [www.tutorialspoint.com/information\\_security\\_cyber\\_law/information\\_security\\_cyber\\_law\\_tutorial.pdf](http://www.tutorialspoint.com/information_security_cyber_law/information_security_cyber_law_tutorial.pdf) (E-book)

**REFERENCE BOOKS:**

1. Bhushan / Rathore / Jamshed, Fundamentals of Cyber Security, First Edition, BPB Publication, 2017.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	DATA MINING AND BIG DATA ANALYTICS	V	18MCA52C

**Objective:** To motivate the students as well to enrich their knowledge about the concepts of data manipulation and big data.

**UNIT I:** Introduction – Data Mining – Relational Databases – Data Warehouses – Transactional databases – Data Mining functionalities – Classification of Data Mining systems – Major Issues in Data Mining.

**UNIT II:** Data Preprocessing – Data cleaning – Missing value, noising data and inconsistent data – Data integration and Transformation – Data reduction – Data cube aggregation – Dimensionality reduction and data compression – Data mining primitives.

**UNIT III:** Classification and predictions – Issues regarding classification and prediction – Classifications by decision tree induction – Classification by Back propagation – Other classification methods

**UNIT IV:** Cluster Analysis – Types of Data in Cluster Analysis – Interval – Scaled variables, Binary variables, Nominal ordinal and ratio - scaled variables – Clustering methods – Partitioning methods – K-means, k-medoids and CLARANS – Hierarchical methods – Agglomerative and Divisive, BIRCH, CURE – Outlier analysis – Data Mining applications.

**UNIT V:** The Big Deal about Big Data: What is Big Data - Why Is Big data important - Big Data. Applying Big Data to Business problems: A sampling of use cases - Big Data use cases - IT for IT – Customer state. Analytics for Big Data at Rest: The Big Data platform for high performance deep analytics- Appliance simplicity – Hardware Acceleration-Balance, massively parallel architecture - Modular design.

**TEXT BOOKS:**

1. Jinwei Han, Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers, New Delhi. (For Unit I, II, III and IV).
2. Paul C Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, David Corrigan, James Giles, “Harness the Power of Big Data”, The McGraw-Hill Publications, 2013, First Edition. (For Unit V).

**REFERENCE BOOKS:**

1. Pieter Adriaans, Dolf Zantinge, "Data Mining", Addison Wesley, 1998.  
Sam Anohory, Dennis Murrey, "Dataware housing in the real world", Pearson, 2004.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	PRINCIPLES OF MARKETING AND MANAGEMENT	V	18MCA53C

**Objective:** To understand the Basic functions of Management.  
To develop marketing Strategies for Product, Price, Promotions and Place.

**UNIT I:** Management and Administration – Functions – Scientific Management. **Management Process Planning:** Steps in Planning Process, Types of plans. **Objectives:** Characteristics and Hierarchy of objectives – Management by Objectives (MBO).

**UNIT II: Organization:** Types - Departmentalization - Bases of Departmentalization – Span of control. Staffing recruitment and Selection – Training and Development.

**UNIT III: Directing:** Principles of direction. **Elements of direction:** Motivation, Leadership and Communication. **Controlling:** Controlling process – Traditional and Modern Controlling Techniques (Budgetary Control, CPM / PERT).

**UNIT IV: Marketing:** Marketing concepts – Modern marketing – Marketing and Selling – Market Segmentation and New Product Development – Product Life Cycle.

**UNIT V:** Pricing and methods and policies – Channels of Distribution-functions- - Sales Promotion program and Techniques – Managing the Sales force – Personal selling – Marketing research: Procedure and Methods.

**TEXT BOOKS:**

1. Koontz and O’ Donald, “Essentials of Management”, McGraw Hill.
2. Philip Kotler, “Marketing Management”, Prentice Hall of India.

**REFERENCE BOOKS:**

1. Peter F. Drucker, “The Frontiers of Management”.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 9: OPEN SOURCE TOOLS LAB	V	18MCA56P

**Objective:** Gaining exposure to build applications using PHP and MySQL Server.

**Exercises:**

1. Building a simple web site for illustrating debugging.
2. Building User Authentication and Personalization.
3. Building a Shopping Cart.
4. Building a Web-Based Email Service.
5. Building a Mailing List Manager.
6. Building Web Forums.
7. Building a Job Web Portal.
8. Building a simple online banking.
9. Building online examination website.
10. Building online quiz website.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Practical 10: DATA MINING LAB	V	18MCA57P

**Objectives :** To apply and learn the data mining techniques on standard databases using any open source data mining tools like R, XLminer and WEKA.

**EXCERCISES:**

1. Implement any 3 classification algorithms and compare the results.
2. Implement any 2 clustering algorithms using any open source data mining tool.
3. Implement the algorithm to generate a decision tree for the given data set.
4. Develop an application to extract association mining rules.
5. Develop an application for implementing one of the clustering techniques.
6. Develop an application for implementing Naïve Bayes classifier.
7. Implement Apriori approach.
8. Design a knowledge flow layout to load, apply attribute selection, and normalize the attributes and to store the results in a CSV saver using WEKA tool.
9. Create a decision tree and train the tree using the given dataset as the training data.  
Report the model obtained after training using WEKA tool.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 1.1: EMBEDDED SYSTEMS	IV	18MCA44E

**Objective:** To enable the students to know the latest concepts of design and scope of embedded system.

**UNIT I:** Introduction to Embedded Systems: Embedded System – Processor in the system – Other hardware units – software embedded into a system – Exemplary Embedded systems – On chip and in VLSI Circuit. Processor and Memory selection for an Embedded systems.

**UNIT II:** Devices and Buses for Device Networks: I/O devices – Timer and counting Devices. Device Drivers and Interrupts Servicing Mechanism: Device drivers – Parallel Port device drivers in a system – Serial Port device in a system – Device drivers for internal programmable timing devices – Interrupt servicing mechanism – context and the periods for context-switching, deadline and interrupt latency

**UNIT III:** Program modeling concepts in single & Multiprocessor systems software – Development Process: Modeling Processes for Software analysis before software Implementation – Programming models for event controlled or response time constrained real time programs – Modeling for microprocessor systems. Software Engineering Practices in the Embedded Software Development Process: Software algorithm complexity – Software Development process life cycle and its models – Software analysis – Software design – Software implementation – Software Testing, Validating and Debugging – Real time programming issues during the software development process – Software project management – Software maintenance – UML.

**UNIT IV:** Inter – process communication & Synchronization of processes, Tasks and threads: Multiple processes in an application – Problem of sharing data by multiple tasks and routines – Inter Process communication. Real Time Operating System: Real time and Embedded systems operating systems – Interrupt routines in RTOS environment – RTOS Task scheduling models, Interrupt latency and Response times of the Tasks as performance Metrics – performance Metric in scheduling models for periodic, sporadic and Aperiodic Tasks – IEEE standard POSIX 1003.1b functions for Standardization of RTOS and Inter-task communication functions – List of Basic actions in a preemptive scheduler and Expected times taken at a processor – Filters – point strategy for synchronization between the processes, ISRs, OS functions and tasks and for Resource management – Embedded Linux Internals.

**UNIT V:** Hardware – Software co-design in an embedded System: Embedded System Project Management – Embedded system design and co-design issues in system development processes –

Design cycle in the development phase for an Embedded system – Uses of Target system, or its Emulator and In-circuit Emulator – Use of software tools for development of an embedded system – Use of scopes and logic analysis for system hardware tests – Issues in Embedded system design. Case Study: An Embedded System for an Adaptive cruise control system in a car, embedded system for a smart card.

**TEXT BOOKS :**

1. Raj Kamal, “Embedded Systems – Architecture, programming and design”, Tata Mcgraw – Hill, 2003.

**REFERENCE BOOKS:**

1. David E. Simon, “An Embedded Software primer” Pearson Education Asia, 2003.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 1.2: SOFTWARE TESTING	IV	18MCA44E

**Objective:** To motivate the students as well as enrich their knowledge about the concepts of testing and its documentation.

**UNIT I:** Developing a test approach – Addressing software system business risk – Defining a software system strategy – Developing software system testing tactics – Testing a software using a life cycle methodology – Requirements phase testing.

**UNIT II:** Design phase testing – Program phase testing – Desk debugging and program peer view test tools – Evaluating test results – Installation phase testing – Acceptance testing.

**UNIT III:** Testing methodology for software maintenance – Testing the correctness of the installing a software change – Testing the validity of a software cost estimate – Testing the progress of the software system – Inspecting test plan and test cases.

**UNIT IV:** Accessing Client–Server and LAN risks – A testing strategy for a rapid prototyping – Testing techniques – Testing tools.

**UNIT V:** Test documentation – Reporting test results – Final test reporting – Evaluating test effectiveness – Use of testing metrics – Improving test process.

**TEXT BOOKS:**

1. William Perry, “Effective Methods for Software Testing”, John Wiley & Sons, Inc., 1995.

**REFERENCE BOOKS:**

1. Renu & Pradeep “Software Testing: Methodologies, Tools and Processes”, Tata McGraw Hill Publishing Co. Ltd.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 1.3: COMPUTER FORENSICS	IV	18MCA44E

**Objective:** To provide good understanding of the role of Computer Forensics. After the successful completion of the course the students should have the thorough knowledge on Fundamentals, Encryption, Hacking, Trackers with examples.

**UNIT I: INTRODUCTION:** Fundamentals – Types – Acquire the Evidence – Authenticate the evidence – Analysis – Internet Fundamentals –Tracking Email – NETBIOS – Third Party programs – Web resources for researching Internet Inhabitants.

**UNIT II: FORENSICS EVIDENCE AND CAPTURE:** Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

**UNIT III: COMPUTER FORENSICS ANALYSIS:** Discovery of Electronic Evidence – Identify of data – Reconstructing past Events – Advanced Tools.

**UNIT IV: LAW AND ETHICS:** Software Forensics in Court – Legal Systems – Evidence – Ethics – Computer Virus and Malware Concept – Programming Culture and Indicators – Stylistic Analysis and Linguistic Forensics.

**UNIT V: ADVANCED COMPUTER FORENSICS:** Advance Encryption– Advance Hacking - Trackers and Hackers –Source Addresses – Examples.

**TEXT BOOKS:**

1. Jay G Heiser and Warren G Kruse, “Computer Forensics: Incident Response Essentials”, Addison Wesley, New Delhi, 2010.

**REFERENCE BOOKS:**

1. Robert M Slade, “Software Forensics: Collecting Evidence from the scene of a Digital Crime”, Tata McGraw Hill, New Delhi, 2011.
2. John R Vacca, “Computer Forensics: Computer Crime Scene Investigation”. Firewall Media, New Delhi, 2005.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 1.4: PARALLEL PROCESSING	IV	18MCA44E

**Objective:** On Successful Completion of the Course the students should have understood Architectures in Parallel Processing and Parallel Algorithms.

**UNIT I:** Introduction to Parallel Processing – Trends towards parallel processing – Parallelism in uniprocessor Systems – Parallel Computer structures – Architectural Classification schemes – Parallel Processing Applications.

**UNIT II:** Solving Problems in parallel: Utilizing Temporal Parallelism – Utilizing Data Parallelism – Comparison of Temporal and Data Parallel Processing – Data parallel processing with specialized Processor – Inter-task Dependency. Structure of Parallel Computers: A Generalized structures of a parallel computers – Vector Computers – Array Processors.

**UNIT III:** Principles of Pipelining and Vector Processing: Pipelining: An overlapped parallelism – Instruction and Arithmetic pipelines – Principles of Designing pipelined processors.

**UNIT IV:** Structures and Algorithms for Array Processors: SI MD Array Processors – SIMD Interconnection Networks. Multiprocessor Architecture and programming Functional structures – interconnection Networks.

**UNIT V:** Parallel Algorithms: Models of computation – Analysis of Parallel Algorithms Prefix Computation – Sorting – Searching – Matrix Operations.

#### TEXT BOOKS

1. Kai Hwang, Faye A. Briggs, “Computer Architecture and Parallel Processing” Tata Mc Graw – Hill Book Company, 1985.
2. V. Rajaraman, C. Siva Ram Murthy, “Parallel Computers Architectures and Programming”, PHI, 2003.

#### REFERENCE BOOKS

1. Kai Hwang – “Advanced Computer Architecture –Parallelism, Scalability, Programmability” Tata Mcgraw Hill 1993.
2. Bary Wilkinson, Michael Allen – “Parallel Programming” – Pearson Education, 2002.
3. Michael J. Quinn, “Parallel Computing Theory and Practice”, TMCH, Second Edition.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 1.5: <b>COMPILER DESIGN</b>	IV	18MCA44E

**Objective:** On Successful Completion of the Course the students should have understood Compiler using Tools, Parsing Techniques and Grammars, Parsers, Syntax Direction, Translation and Code Generation.

**UNIT I:** Introduction – Structure of a Compiler – Compiler writing Tools – Basic constructs of High level Programming languages: Data structures, Parameter transmission. Lexical analysis – Role of lexical analyzer – Finite automata – Regular expressions to Finite automata – NFA to DFA – Minimizing the number of states of a Deterministic Finite Automata – Implementation of a Lexical Analyzer.

**UNIT II:** Parsing techniques – Context free grammars – Derivations and Parse trees – Ambiguity – Capabilities of Context free grammars – Top down and Bottom up parsing – Handles – Shift Reduce parsing – Operator precedence parsing – Recursive descent parsing – Predictive parsing.

**UNIT III:** Automatic parsing techniques – LR parsers – Canonical collection of LR(0) items – Construction of SLR parsing table – LR(1) sets of items Construction – Construction of canonical LR Parsing Tables.

**UNIT IV:** Syntax Direction Translation – Semantic actions – Implementation of Syntax Directed Translators – Intermediate Code: Postfix notation, Quadruples, Triples, Indirect triples – Methods of translation of Assignment statements, Boolean expressions and Control statements.

**UNIT V:** Symbol tables and Code generation: Representing information in a Symbol Table – Data Structures for Symbol table – Introduction to Code Optimization: Basic blocks – DAG representation – Error detection and recovery – Introduction to Code Generation.

**TEXT BOOKS:**

1. Aho A. V. R, Ullman J. D., Compilers, Principles, Techniques and Tools, Addison Wesley, 2001

**REFERENCE BOOKS:**

1. Dhamdhare D. M., Compilers construction Principles and Practice, Macmillan India Ltd.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 2.1: E-COMMERCE	IV	18MCA45E

**Objective:** To provide good understanding of the role of E-Commerce. After the successful completion of the course the students should have the thorough knowledge on WWW, Electronic payment systems, Information systems.

**UNIT I:** Electronic Commerce framework – Electronic Commerce of Media convergence - The Anatomy of E-commerce applications – Electronic Commerce Applications – Electronic Commerce Organization Applications – Market Forces Influencing the I-way – Components of the I-way – Network Access Equipment – the Last Mile: Local roads and access Ramps – Global Information Distribution Networks – Public policy Issues shaping the I-way

**UNIT II:** Architectural framework for electronic commerce – World Wide Web (WWW) as the architecture – Web background: Hypertext publishing – Technology behind the web – security and the web – Consumer-oriented applications – Mercantile models from the consumer’s perspective – Mercantile models from the Merchant’s Perspective

**UNIT – III:** Types of Electronic payment systems – Digital Token-Based Electronic Payment Systems – Smart cards and Electronic Payment Systems – Credit Card based Electronic Payment systems – Risk and Electronic Payment Systems – Designing electronic payment systems – Electronic data interchange – EOI Applications in Business – EDI: Legal, Security, and Privacy issues – EDI and Electronic Commerce.

**UNIT IV:** Internal Information systems – Macro forces and Internal Commerce – Work Flow Automation and Coordination Customization and Internal commerce – Supply chain commerce systems – making a business case for a document Library – Types of digital documents – Issues behind Document Infrastructure – corporate Data warehouses.

**UNIT V:** The New Age of Information - Based Marketing – Advertising on the Internet – charting the Online Marketing process – Market Research – Search and Resource Discovery Paradigms – Information search and Retrieval – Electronic commerce Catalogs or Directories – Information Filtering – Consumer – Data Interface Emerging Tools.

**TEXT BOOKS:**

1. Ravi Kalakota, Andrew B. Whinston, “Frontiers of Electronic Commerce”, Pearson Education Asia, 2003.

**REFERENCE BOOKS:**

1. Jeffery F. Rayport, Bernard J. Jaworski, “E- Commerce”, TMCH, 2002.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 2.2: GREEN COMPUTING	IV	18MCA45E

**Objective:** To provide good understanding of the role of Green Computing. After the successful completion of the course the students should have the thorough knowledge on its importance, collaboration, metrics and with case studies.

**UNIT I: Importance Of Green IT:** The growing significance of Green IT and Green data centers -All basic steps towards Green IT - The Basics of Green IT.

**UNIT II: Collaboration For Green IT:** The government's role - Regulation and EPA activity - Regulating greenhouse gases - Role of the EPA - IT Company support of government regulation - Educational institutions and government regulation.

**UNIT III: Magic Of Incentive:** The role of electric utilities - A most significant step – Virtualizing IT systems: Consolidation and Virtualization - Data Storage.

**UNIT IV: Metrics And Standards:** Need for standard IT Energy - Use metrics: SPEC - EPA – LEED - Green grid data center power - Efficiency metrics: PUE and DciE, Data center - Strategies for increasing data center - Cooling efficiency - Fuel cells for data center electricity – Emerging technologies for data centers.

**UNIT V: Case Studies:** Web, Temporal and Spatial Data Mining Green IT Case Studies For Energy Utilities -Green IT case studies for universities and a large company - Worldwide green IT - Case studies - The future of green IT for corporations.

**TEXT BOOKS:**

1. Frederic P Miller, Agnes F Vandome and John McBrewster, “Green Computing”, Alpha Script Publishing, 2006.

**REFERENCE BOOKS:**

1. John Lamb, “The Greening of IT-How Companies can make a difference for the environment”, IBM Press, 2009.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 2.3: TCP / IP	IV	18MCA45E

**Objective:** On Successful Completion of the Course the students should have understood ARP, RARP, Group Management, FTP, and SNMP Protocols.

**UNIT I: A Brief History:** Arpanet – (TCP/IP) – Milnet – Csnnet – Nsfnet – Ansnnet – Protocols and Standards – Standards Organizations – TCP/IP Protocol Suite – Addressing – Connection Devices. Introduction – Classful addressing – Subnetting – Supernetting – Classless addressing.

**UNIT II:** ARP & RARP – ARP over ATM – Proxy ARP. ARP Package – RARP – Internet Protocol (IP) – Datagram – Fragmentation – options – Checksum: IP Package. Internet Control Messang Protocol (ICMP) – Types of Message – Message format – error Reporting – Query – Checksum – ICMP Package.

**UNIT III:** Group Management – IGMP Message: IGMP operation – Process to Process Communication – UDP Operation – TCP services – Flow control – Multicast Routing: Multicast routing protocols. Bootp & DHCP – Booth – UDP Ports – using TFTP – Dynamic host Configuration Protocols (DHCP) – Domain Name system (DNS) – Name Space – Domain Name Space – distribution of Name space – DNS in the Internet – Resolution – DNS Message – Types of records.

**UNIT IV: File Transfer Protocol (FTP):** Connections – Communication Command Processing – file Transfer – User interface – Anonymous FTP. Simple Mail Transfer Protocol (SMTP): User Agent (UA) – Addresses – delayed Delivery – Aliases – Mail transfer agent (MTA) – Commands and Responses – Mail Transfer Phases – Multipurpose Internet Mail Extensions (MIME) – Mail Delivery – Mail Access Protocols.

**UNIT V:** Simple Network Management Protocols: (SNMP) – Concept – Management Components – SMI – MIB – SNMP – Messages – UDP Ports – Security. IP over ATM: ATM Wans – Carrying Datagram in cells – Routing the cells – Atmarp – Logical IP Subnet (LIS). Mobile IP: Addressing – Agents – Three Pahses – Agent Discovery – Registration – Data Transfer – Inefficiency in Mobile IP – Virtual Private Networks (VPN).

**TEXT BOOKS:**

1. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, Second edition, Tata Mcgraw – Hill Publishing Company .

**REFERENCE BOOKS:**

1. W. Richard Stevens, “TCP/IP Illustrated Volume1, The Protocols”, Pearson Education.
2. Comer, “Internetworking with TCP / IP, Vol. 1: Principles, Protocols & Architecture, “Fourth Edition, Pearson Education.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 2.4: SERVICE ORIENTED ARCHITECTURE (SOA)	IV	18MCA45E

**Objective:** On Successful Completion of the Course the students should have understood SOA Architecture, Quality of Services, UDDI, SOAP API and Security for Web Services.

**UNIT I: Introduction To Service Oriented Architecture:** Service Oriented Architectures – Business value of SOA - Characteristics of SOA - SOA Architecture – Service based collaboration through Federation – Component Definition - Component Granularity – Component Based Software Engineering – Enterprise Service bus – SOA Enterprise Service Model.

**UNIT II: Quality Of Service:** Web services orchestration – Workflow and Business Process Management – Business Process Execution Language – ACID Transactions - Web services Transactions – SOA Management – Systems Management – Alerting – Provisioning – Leasing – Lifecycle management – Management Architecture.

**UNIT III: Fundamental Pieces of Software Oriented Architecture:** Universal Description Discovery and Integration – Programming UDDI – UDDI Data Model – UDDI SOAP APIs – Inquiry APIs – Publisher APIs – Web Service Definition Language – Defining Message data types –

**UNIT IV:** Defining Operations on Messages – Importing WSDL documents – Extensions for binding to SOAP – Simple Object Access Protocol – SOAP Specification – SOAP Message processing – SOAP use of Namespaces – SOAP Multipart MIME attachments.

**UNIT V: Web Services Standards:** Web Services Security – WS Trust – WS Privacy – WS SecureConversation – WS Federation - Web Services Coordination – Web Services Policy – Web Services Reliable Messaging – Web Services Attachments.

#### TEXT BOOKS

1. Thomas Erl, “Service Oriented Architecture (SOA): Concepts, Technology and Design”, Prentice Hall, New Delhi, 2008.

#### REFERENCE BOOKS:

1. James McGovern, Oliver Sims, Ashish Jain and Mark Little, “Enterprise Service Oriented Architectures: Concepts, Challenges Recommendations”. Springer, New York, 2006.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 2.5: GRID COMPUTING	IV	18MCA45E

**Objective:** To motivate the students as well as enrich their knowledge about the concepts of data grid and applications of grid.

**UNIT I: Introduction:** Parallel and Distributed Computing – Cluster computing - Grid Computing Anatomy and Physiology of Grid - Web and Grid Services.

**UNIT II: Framework:** Architecture – Implementation of Grid architecture – Grid Services - OGSI – OGSA - WSRF – Grid Resource and Service Management – Layers of Grid Computing – Grid monitoring – Grid Security.

**UNIT III: Data and Knowledge Grid:** Data Source – Collective Data Service - Data Management - Knowledge Oriented Grid.

**UNIT IV: Grid Middleware:** List of Globally available toolkits – GT3 – Architecture details – Security - System level Services – Load Balancing.

**UNIT V: Applications:** Scientific – Medical – Bioinformatics – Federated – ERM – Collaborative Science – Case Study.

**REFERENCE BOOKS:**

1. Ian Foster, Carl Kesselman, “The Grid 2: Blueprint for a New Computing Infrastructure”, Elsevier Series, 2004.
2. Vladimir Silva, “Grid Computing for Developers, Charles River Media,” January 2006.

**REFERENCE BOOKS:**

1. . Parvin Asadzadeh, Rajkumar Buyya, Chun Ling Kei, Deepa Nayar, and Srikumar Venugopal, “Global Grids and Software Toolkits: A Study of Four Grid Middleware Technologies.
2. High Performance Computing: Paradigm and Infrastructure”, Laurence Yang and Minyi Guo (editors), Wiley Press, New Jersey, USA, June 2005.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 3.1: DIGITAL IMAGE PROCESSING	V	18MCA54E

**Objective:** This course presents the Introduction to Digital image Processing, fundamentals, image Enhancement and image restoration techniques, To enable the student to understand the fundamentals of Color Image Processing, image compression/decompression and Segmentation, To enable the students to learn the principles and functions of Image Pre- Processing Techniques, image Transformation and quantization. They will have skills in image processing

**UNIT I: Introduction:** What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.

**UNIT II: Image Enhancement In The Spatial Domain:** Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

**UNIT III: Image Restoration:** A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.

**UNIT IV: Image Compression:** Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.

**UNIT V: Image Segmentation:** Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.

**TEXT BOOKS:**

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, Pearson Education.

**REFERENCE BOOKS:**

1. B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis” 2<sup>nd</sup> Edition, PHI, 2011.
2. Pakhira, M. K, “Digital Image Processing and Pattern Recognition”, PHI, 2011.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 3.2: BIO INFORMATICS	V	18MCA54E

**Objective:** To motivate the students as well as enrich their knowledge about the concepts of DNA sequence, biological sequence and Proteomics concepts in bioinformatics.

**UNIT I:** Introduction – Importance of Bioinformatics – Biological Sequence / Structure – Deficit – Genome Projects – Status – Sequence analysis – Homology and analogy. EMBNET – NCBI – Virtual Tourism. Primary Sequence Databases. Biological data base – Primary Sequence Database – Composite Protein Sequence Database – Secondary database – Composite protein – Pattern database – structure and classification of database.

**UNIT II:** Genome Information Resources. DNA Sequences data base – Specialised genomic Resources. DNA Sequence analysis. Why analyse DNA? – Gene structure – Features of DNA sequence analysis – Issues in the interpretation and EST search – Approach of Gene hunting – Cell CDNA libraries and ESTs – Approaches to EST analysis – Effect of EST data on DNA data base examples of EST analysis.

**UNIT III:** Data Base Searchers and Pair Wise Alignment. Data base searching – Alphabets and Complexity – Comparing Two Sequences – Sub-Sequence – Identity and Similarity – Dot plots – Simple alignment – Gaps – Scoring Matrices – Dynamic Programming – BLAST and its relative – FASTA and related algorithms – Alignment scores and statistical significance of database sequences. Global and local Alignments: Algorithms – Similarities – Semi global alignment.

**UNIT IV:** Multiple Sequence Alignment. Goal – Definition – Consensus – Complex – Methods – Database of multiple Alignment – searching database with multiple alignment. Methods of Photo Genetics. Distance Based Methods – Based Methods – Comparison.

**UNIT V:** RNA Structure. Amino Acids – Polypeptide Composition Algorithm – Modeling protein folding prediction – RNA Sequence Structure. Proteomics: Classification – Techniques – Inheritors – Drying Design – Structures – X-Ray Crystal – NMR – Empirical Methods and prediction techniques.

**TEXT BOOKS:**

1. T.K. Attwood, D.J. Parry-Smith, "Introduction to Bioinformatics", Pearson Education Asia, 2003.

**REFERENCE BOOKS:**

1. Dan E. Krane, Michale L. Raymer, "Fundamental Concepts of Bioinformatics", Pearson Education Asia, 2003.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 3.3: PERVASIVE COMPUTING	V	18MCA54E

**Objective:** On Successful Completion of the Course the students should have understood Pervasive Applications Development, Location Management and Location based services.

**UNIT I: Introduction:** Pervasive Computing – Principles – Pervasive Computing Applications – Pervasive Information Technology – Pervasive Information Access Devices – Smart Identification, Smart card, labels, tokens – Embedded Controls, Smart Sensors, Actuators, Appliances, Home Networking, Entertainment – Pervasive Application Development Software – Operating System, Windows CE, Palm OS, Symbian OS, Java Card – Middleware – Security – Connecting the World, WWAN, SRWC, DECT, Bluetooth, IrDA – Mobile Internet – Internet Protocols.

**UNIT II: Pervasive Application Development:** Approaches for Developing Pervasive Applications – Developing Mobile Applications – Presentation Transcoding – Device Independent View Component – Heterogeneity of Device Platforms – Dynamics of Application Environment – ISAM Application Model – ISAM Architecture – Context Awareness and Mobility to Building Pervasive Applications.

**UNIT III: Location Management:** Introduction to Location Management – DNS Server, Server Process, Client Process – Location Update – Location Inquiry – Location Management Cost – Network Topology – Mobility Pattern, Memory Less Movement Model, Markovian Model, Shortest Distance Model, Gauss-Markov Model, Activity Based Model, Mobility Trace, Fluid-Flow Model, Gravity Model.

**UNIT IV: Location Updates and Locating Moving Objects:** Location Update Strategies, Always update, Never-Update, Time Based, Movement Based, Distance Based Update Strategies – Architecture of Location Directories, Two-Tier Scheme, Hierarchical Scheme – Optimization of the Architecture – Taxonomy and Location Management Techniques – Case Studies.

**UNIT V: Location Based Services:** Research on Location Based Services – Location Relatedness and the Query Model - Location Dependent Data – Location Aware Queries – Location Dependent Queries – Moving Object Database Queries – Query Classification – Query Translation Steps in LDQ Processing – Case Studies.

**TEXT BOOKS:**

1. Horst Henn, Jochen Burkhardt and Thomas Schack, “Pervasive Computing”, Pearson Education, 2009.
2. Uwe Hansmann, Martin S Nicklous and Thomas Stoper, “Pervasive Computing Handbook”, Springer-Verlag, 2001.

**REFERENCE BOOKS:**

1. Mohammad Ilyas and Imad Mahgoub, “Mobile Computing Handbook”, Auerbach Publications, 2005.
2. Uwe Hansmann, Martin S. Nicklous and Thomas Stoper, “Principles of Mobile Computing”, Springer-Verlag, 2001.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 3.4: SOCIAL NETWORKING AND WEB MINING	V	18MCA54E

**Objective:** To motivate the students as well as enrich their knowledge about the concepts of social networking, its properties and about web mining.

**UNIT I: Introduction:** Data mining and web mining – web community and social network analysis – Evolution of social networks – Basic concept in social networks

**UNIT II: Social Network Data and Representation:** Structural – composition - affiliation variables- modes-boundary specification and sampling- type of networks- measurement and collection – Notation for social network data - Review of graph theory - Data set- Tools - Pajek, Netdraw, UCInet

**UNIT III: Structural Properties of Social Networks:** Notions of centrality, cohesiveness of subgroups, roles and positions, block models - stochastic block models – Information diffusion – power law.

**UNIT IV: Web Mining:** Web crawler – types of web crawler - Web search – Characteristic of Web data – types of web mining.

**UNIT V: Web Content Mining:** Web Content Mining: Vector Space Model, Web Search, Activities on Web archiving, Personalized Web Search, Feature Enrichment of Short Texts, Latent Semantic Indexing, Automatic Topic Extraction from Web Documents Opinion Search and Opinion Spam. **WEB Linkage Mining:** Hyperlinks- co-citation and bibliographic coupling- page rank and HITS algorithm – web community discovery – web graph measurement and modeling- using link information for web page classification.

**TEXT BOOKS:**

1. Stanley Wasserman and Katherine Faust, “Social network analysis: methods and applications”, Cambridge University Press, 1999.
2. Guandong xu and Yanchun zhang, “Web mining and social networking: techniques”, “Springer Science and Business Media”, 2011

**REFERENCE BOOKS:**

1. Bing Liu, “Web Data Mining”, Springer, 2010
2. Anthony Bonato, “A Course on Web Graphs”, Americal Mathematical Society, 2008

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 3.5: INTERNET OF THINGS	V	18MCA54E

**Objective:** On Successful Completion of the Course the students should have understood IOT Protocols, Web of Things, Network Dynamics applications.

**UNIT I: Introduction:** Definitions and Functional Requirements – Motivation – Architecture - Web 3.0 View of IoT – Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End - user Participation in the Internet of Things. **Middleware for IoT:** Overview – Communication middleware for IoT – IoT Information Security.

**UNIT II: IOT Protocols:** Protocol Standardization for IoT - Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization - Unified Data standards - Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security.

**UNIT III: Web of Things:** Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT – Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

**UNIT IV: Integrated:** Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small -World Phenomenon.

**UNIT V: Applications:** The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments – Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.

**TEXT BOOKS:**

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press 2012.
2. Dieter Uckelmann; Mark Harrison; Florian Michahelles, "Architecting the Internet of Things", Springer 2011.

**REFERENCE BOOKS:**

1. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
2. Olivier Hersent, Omar Elloumi and David Boswarthick, "The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley 2012.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 4.1: SOFT COMPUTING	V	18MCA55E

**Objectives:** To motivate the students as well as enrich their knowledge about the concepts of Artificial Intelligence, neural networks and genetic algorithms.

**UNIT I: Artificial Intelligence (AI):** Characteristics of AI problem – state space representation – AI search strategies: Brute force, depth first, breadth first, best first, hill climbing and A\* algorithms.

**UNIT II: Knowledge Representation:** Logic – Propositional calculus – Predicate calculus – rules of inference – resolution – unification algorithm – semantic networks – frames – script. **Soft Computing and Conventional AI:** Constituents – characteristics – hybrid models.

**UNIT III: Fuzzy Set Theory:** Fuzzy sets – basic definitions – membership functions – fuzzy rules and reasoning – fuzzy relations – fuzzy if-then rules – fuzzy reasoning.

**UNIT IV: Neural Networks:** Basic concepts – network properties – learning in simple neurons – single layer perceptron's – multilayer perceptron's – supervised and unsupervised learning – Backpropagation network, Kohonen's self organizing network, Hopfield network.

**UNIT V: Genetic Algorithms:** Survival of the fittest – fitness computations – cross over – mutation – reproduction – rank method – rank space method.

**TEXT BOOKS:**

1. Patrick Henry Winston, "Artificial Intelligence", Pearson Education, 2000.
2. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.
3. Ross Timothy J., " Fuzzy Logic with Engineering Applications", Tata McGraw Hill , 1997.
4. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 2002.

**REFERENCE BOOKS:**

1. Patterson Dan W., "Artificial Neural Networks", Prentice Hall, 1996.
2. Jang J. S. R., Sun C. T. and Mizutani E., "Neuro- fuzzy and Soft Computing", Prentice Hall, 1997.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 4.2: PROGRAMMING FOR ROBOTICS	V	18MCA55E

**Objective:** To provide good understanding of the programming of Robotics , Programming Kinect with Python using ROS. After the successful completion of the course the students should have the thorough knowledge on Basics of Robotics, Simulation, Designing and working with sensors.

**UNIT I: Basics of Robotics:** History – Definition – Components – Building a robot – The Robot drive mechanism.

**UNIT II: Robot Simulation:** Mathematical modeling of the robot - Robot kinematics – Concepts of ROS and Gazebo.

**UNIT III: Designing Chefbot Hardware:** Specifications - Block diagram - Working with Robotic Actuators and Wheel Encoders - Interfacing DC geared motor with Tiva C LaunchPad - Interfacing quadrature encoder with Tiva C Launchpad - Working with Dynamixel actuators.

**UNIT IV: Working With Robotic Sensors:** Working with ultrasonic distance sensors - Working with the IR proximity sensor - Working with Inertial Measurement Unit.

**UNIT V: Python and ROS:** Introduction to Open CV, Open NI, and PCL - Programming Kinect with Python using ROS, Open CV, and Open NI - Working with Point Clouds using Kinect, ROS, OpenNI, and PCL.

**TEXT BOOKS:**

1. Lentin Joseph, “Learning Robotics using Python”, PACKT Publishing, 2015.
2. Bill Smart, Brian Gerkey, Morgan Quigley, “Programming Robots with ROS: A Practical Introduction to the Robot Operating System”, O’Reilly Publishers, 2015.

**REFERENCE BOOKS:**

1. Aaron Martinez and Enrique Fernandez, “Learning ROS for Robotics Programming”, PACKT Publishing, 2013.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 4.3: Artificial Intelligence and Expert Systems	V	18MCA55E

**Objectives:** To motivate the students as well as enrich their knowledge about the concepts of Artificial Intelligence, neural networks and genetic algorithms.

**UNIT I: Introduction: AI Problems** – AI techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search.

**UNIT II: Heuristic Search Techniques:** Generate and Test – Hill Climbing – Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – Frame Problem.

**UNIT III: Using Predicate Logic:** Representing simple facts in logic – Representing Instance and Isa relationships – Computable functions and predicates – Resolution – Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Control knowledge.

**UNIT IV: Statistical Reasoning:** Probability and Bayes Theorem- Certainly Factors and Rule- Based systems Bayesian Networks - Dempster - Shafer Theory-Fuzzy logic . Knowledge representation: Syntactic - Semantic Spectrum of Representation-Logic and Slot-and Filter Structures - Other Representational Techniques – Planning – Understanding.

**UNIT V:** Learning – Common sense – Perception and Action – Expert System.

**TEXT BOOKS:**

1. Elaine Rich and Kevin Knight, " Artificial Intelligence", Tata McGraw Hill Publishers company Pvt. Ltd, Second Edition, 1991. (Chapters 1 – 6 only).

**REFERENCE BOOKS:**

1. George F Luger, "Artificial Intelligence", 4th Edition, Pearson Education Publ., 2002.

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 4.4: WIRELESS SENSOR NETWORKS	V	18MCA55E

**Objective:** On Successful Completion of the Course the Students should have understood Sensor Networks Hardware and Software, Sensor Network Databases and Tools.

**UNIT I: Introduction:** Unique Constraints and Challenges -Advantages of Sensor Networks - Energy advantage - Detection advantage - Sensor Network Applications - Habitat monitoring - Tracking chemical plumes - Smart transportation- Collaborative Processing - Key Definitions of Sensor Networks . **Canonical Problem:** Localization and Tracking - A Tracking Scenario - Problem Formulation – Sensing model - Collaborative localization. Bayesian state estimation - Distributed Representation and Inference of States - Impact of choice of representation.

**UNIT II: Networking Sensors:** Key Assumptions -Medium Access Control - The S-MAC Protocol - IEEE 802.15.4 Standard and ZigBee - General Issues - Geographic, Energy - Aware Routing - Unicast Geographic Routing - Routing on a Curve – Energy - Minimizing Broadcast – Energy - Aware Routing to a Region – Attribute - Based Routing - Directed Diffusion.

**UNIT III:** Infrastructure Establishment - Topology Control - Clustering - Time Synchronization - Clocks and Communication Delays - Interval Methods- Reference Broadcasts -Localization and Localization Services -Ranging Techniques – Range Based Localization Algorithms - Other Localization Algorithms - Location Services.

**UNIT IV: Sensor Network Databases :** Sensor Database Challenges - Querying The Physical Environment - Query Interfaces - Cougar sensor database and abstract data types - Probabilistic queries -High-level Database Organization - In-Network Aggregation - Query propagation and aggregation – TinyDB query processing - Query processing scheduling and optimization - Data-Centric Storage - Data Indices and Range Queries – One-dimensional indices - Multi-dimensional indices for orthogonal range searching – Non orthogonal range searching.

**UNIT V:** Sensor Network Platforms and Tools - Sensor Network Hardware -Berkeley motes - Sensor Network Programming Challenges - Node-Level Software Platforms - Operating system: TinyOS - Imperative language: nesC - Dataflow style language: TinyGALS - Node-Level Simulators - ns-2 and its sensor network extensions.

**TEXT BOOKS:**

1. Wireless Sensor Networks An Information Processing Approach ”, **Feng Zhao and Leonidas Guibas** , **Morgan Kaufmann Publishers (An imprint of Elsevier)** , **2004**.

**REFERENCE BOOKS:**

1. Wireless Sensor Networks A Networking Perspective”, Jun Zheng, Abbas Jemalipour, Wiley Publications 2014.
2. Fundamentals of Wirelss Sensor Networks Theory and Practice”, Walteneus Dargie, Christian Poellabauer, Wiley Publications,2013

Year	Subject Title	Semester	Sub Code
2018-2019 Onwards	Elective 4.5: OPEN SOURCE TOOLS	V	18MCA43C

**Objective:** On Successful Completion of the Course the students should have understood concepts in Linux and Windows, PHP Programming using Arrays and Functions, RAILS, RUBY TOOL and Apache Web Server.

**UNIT I: Introduction:** Introduction to Open sources – Need of Open Sources – Advantages of Open Sources – Application of Open Sources- Bug Fixing – Commercial aspects of Open Source Systems- Software patenting and violations. **Open Source Programming Languages:** PHP: Introduction – Programming in web environment – variables – constants – data types – operators – Statements – Functions – Arrays – OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP and LDAP – PHP Connectivity – Sending and receiving E-mails – Debugging and error handling – Security – Templates.

**UNIT II: Open Source Database:** Documents Database- MongoDB- Installation – crud operations- insert, modify, remove & query documents- 2-phase commits- Data models-Administration-security – aggregation- Indexes- Mongo shell – operators- couch DB over MongoDB.

**UNIT III: RAILS:** Introduction - DRY - COC - MVC - REST - Migrations - Active Record Validations - Active Record Associations - Active Record Query Interface - Layouts and Rendering - Action Controller - Rails Routing.

**UNIT IV: RUBY:** History and Design of Ruby – Classes, Objects and Variables – Containers, Blocks and Iterators – Standard Types – Methods – Expressions – Exceptions – Modules – Input and Output – Threads and Processes – Ruby and Web – Reflection – Object Space – Distributing Ruby.

**UNIT V: Open Source Tools and Technologies:** WEB SERVER: Apache Web server – Working with Web Server – Configuring and Using apache web services.

**TEXT BOOKS:**

1. Karl Fogel, “Producing Open Source Software”, O’Reilly, 2006.
2. Rasmus Lerdorf and Kevin Tatroe, “Programming PHP”, O’Reilly, 2013.
3. Wesley J Chun, “Core Python Application Programming”, Prentice Hall, 2012.
4. Carlson and Leonard Richardson, “Ruby Cookbook”, O’Reilly Media, 2008.
5. Peter Wainwright, “Professional Apache”, Wrox Press, 2002.

**REFERENCE BOOKS:**

1. Kristina Chodorow and Michael Dirolf, “MongoDB: The Definitive Guide”, O’Reily, 2010.
2. Wesley J Chun, “Core Python Application Programming”, Prentice Hall, 2012.

## MODEL QUESTION PAPER

### Question Paper Pattern (External 75 marks)

- Section-A** 20 marks (10 Short answer Type Questions of 2 mark each; No choice)  
(10 X 2 = 20)
- Section-B** 25 marks (5 Questions either or type of 5 marks each)  
(5 X 5 = 25)
- Section-C** 30 marks (Three Questions out of 5 Questions, 10 marks each)  
(3 X 10 = 30)

### Question Paper Pattern (Internal 50 marks)

- Section-A** 10 marks (5 Short answer Type Questions of 2 mark each; No choice)  
(5 X 2 = 10)
- Section-B** 20 marks (4 Questions either or type of 5 marks each)  
(4 X 5 = 20)
- Section-C** 20 marks (Two Questions out of 3 Questions, 10 marks each)  
(2 X 10 = 20)