Shree H. V. P. Mandal's

Degree College of Physical Education, Amravati.

(Multi-faculty Autonomous College)

FACULTY OF SCIENCE AND TECHNOLOGY

(SCIENCE GROUP)

CURRICULUM SCHEME AND SYLLABUS OF

FIRST YEAR

MASTER OF SCIENCE (COMPUTER SCIENCE)

(Choice Based Credit System)

Program Code: MSC2017

Introduced from the Session 2017-2018

Master of Science in Computer Science (M. Sc. Computer Science)

Programme Outcomes (PO): The following Programme Outcomes are attained after completion of this programme:

PO 1. Students become successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms.

PO 2. Able to contribute to society as broadly educated, expressive, ethical and responsible citizens with proven expertise.

PO 3. Capable to achieve peer-recognition; as an individual or in a team; through demonstration of good analytical, design and implementation skills.

PO 4. Successfully pursue lifelong learning to fulfill their goals.

Programme Specific Outcomes (PSO): M.Sc. (Comp. Sci.) has been designed to prepare graduates for attaining the following Programme Specific Outcomes:

PSO 1. Able to select modern computing tools and techniques and use them with dexterity.

PSO 2. Able to identify, analyze, formulate and develop computer based solutions to meet desired needs within realistic constraints such as safety, security and applicability.

PSO 3. Able to devise and conduct experiments, interpret data and provide well informed conclusions.

PSO 4. Identify research and development areas in multiple disciplines.

Degree College of Physical Education,

(Multi-faculty Autonomous College)

SPECIAL NOTE FOR THE STUDENTS

1) This is notified for general information and guidance of all concerned for admission and examination to Master of Science in Computer Science.

2) All the students desirous to take examinations for which this prospectus has been prescribed should if found necessary for any other information regarding examinations etc. refer the examination rules of this autonomous college.

Pattern of Question Papers for Semester/Final Examinations of MSc Programme in Choice Based Credit System

For Theory Examination

1. Under the CBCS curriculum, the semester/final theory examination shall be conducted for each course (Subject) as per the schedule declared by the Examination Section.
2. The question paper shall be of maximum 70 marks, containing ten questions, two questions on each unit and students are required to attempt any one of two.
3. No objective type multiple choices question allowed.
4. Every question will be of fourteen marks and may contain sub questions. Distribution of marks shall be given on the right of each question.
5. The questions' numbering will be as follows: Q. 1: or Q. 2:, Q. 3: or Q. 4:, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q.10
6. The question shall be target to evaluate knowledge, skill, thinking ability and application. Weightage shall be given in decreasing order of Knowledge, thinking ability, application and skill.

For Practical Examination

1. Question paper for practical examination will be of 20 Marks, two questions of ten marks each.
2. Question number one shall contain six problems/programs/experiments and student attempt any two out of these questions.
3. Question number two contain two sub questions (a) and (b) each of five mark.
4. Question number 2(a) contain five MCQ. Question number 2(b) contain one logical question/problem to test students' ability of solving problems (Setter may ask to solve real life problems based on case study)

Examination Leading to the
Degree of Master of Science
(Computer Science)
(Bi-annual Pattern)
(Two Year Course)

Whereas, it is expedient to prepare a new rule for Examination leading to the Degree of Master of Science (Computer Science) (Bi-annual) (Two Year Course) under CBCS for the purposes hereinafter appearing in the Academic Board and Board of Management.

1. This Rule may be called "Examination Leading to the Degree of Master of Science (Computer Science) (Bi-Annual Pattern) (Two Year Course) CBCS.
2. This rule shall come into force w.e.f. the Session 2017-18 for the Degree of Master of Science (Computer Science) (Bi-Annual Pattern) (Two Year Course) under CBCS.
3. Subject to their compliance with the provisions rules in force from time to time. The following person shall be eligible for admission to M.Sc. first year (Computer Science).
    a) A person who has passed the degree of Bachelor of Science of any statutory University with Computer Science / Computer Application as one of the subjects.

    OR

    b) A Person who has passed B.A. / B.Sc. with Mathematics plus post Graduate Diploma in Computer Science of S.G.B. Amravati University.

    OR

    c) A person who has passed a Degree of bachelor of Computer Science.
4. A person who has passed M.Sc. First Year Computer Science of this Autonomous college or any other affiliated colleges of S.G.B.AmravatiUniversity shall be eligible for admission to M.Sc.Second Year (Computer Science).
5. The Degree of Master of Science (Computer Science) shall be awarded to an examinee who, in accordance with the provisions of this rule qualifies for the degree.
6. Duration of the Programme shall be two academic Years. The First Year M.Sc. (Computer Science) divided into two semesterscalled as Semester I, Semester II. The Second Year M.Sc. (Computer Science) also divided into two semesterscalled as Semester III and Semester IV. The College shall hold Examination in Winter and in Summer every year for both the even and odd semester.
7. The regular Examination of Semester–I and Semester- III shall be conduted in winter & the regular Examination of Semester- II and Semester- IV shall be conducted in summer every year.Supplementary Examination for Semester– I and Semester- III shall be held in summer and the supplementary examination for Semester–II and Semester-IV shall be held in winter every year.
8. For purpose of instructions and Examinations the students shall study sequentially.
9. The period of academic session / term shall be such as may be notified by this

AutonomousCollege.

10. The Examinations as given in Para – 7 above shall be held at such dates as may be notified by this autonomous college.
11. Subjects to his/her compliance with the provision of this rule and of other rules pertaining to examinations in force from time to time the applicant for admission at the end of the course of study of a particular term shall be eligible to appear at it, if,

(i) He/She satisfied the conditions in the table and the provisions there under.

(ii) He/She has prosecuted a regular course of study in this college.

(iii) He/She has in the opinion of the Head of the Department/Principal shown satisfactory progress in his / her studies.

Sr. No	Course and Level	Type of Admission	Eligibility	Remark
1	MSc Semester-I	Direct Admission	As mentioned in Para-3	
2	MSc Semester-II	Natural Growth	---	
3	MSc Semeste-III	Natural Growth	Having Passed Minimum 50% of total passing heads collectively of MSc Semester-I and Semester-II	
5	MSc Semester IV	Natural Growth	---	

12. The papers and practical in which an examinee is to be examined. The maximum marks for these and the minimum pass marks which an examinee must obtain in order to pass in the subject and the examination shall be as per the curriculum.
13. (i) The scope of the subjects is as indicated in the syllabus.
    (ii) The Medium of instruction and examination shall be English.
14. There shall be no classification of examinees successful in M.Sc. Semester –I, M.Sc. Semester–II, M.Sc. Semester-III and M.Sc. Semester-IV examimation separately.
15. Examinees thosewho are successful in M.Sc. (Computer Science) Semester-IV Examination and all other three previous Semester examinations shall be declared passed and CGPA and programme grade will be computed as per the provision and rules of examinations under CBCS for this autonomous college.
16. An examinee who does not pass or who fails to present himself herself for the examination shall be eligible for readmission to the same examination,on payment of fresh fees and such other fees as may be prescribed.
17. As soon as possible after the examinations the Examination Committee shall publish a result of the examinees. The result of final M.Sc. Examination shall be declaredas

mentioned in para-15 above and merit list shall be notified as per the rules.

18. Not withstanding anything to the contrary in this rule no one shall be admitted to an examination under this rule, if he/ she has already passed the same examination or an equivalent examination of any statutory University.
19. (i) The examinees who have passed in all the subject prescribed for all the examinations shall be eligible for award of the Degree of Master of Science (Computer Science) by S. G. B. Amravati University, Amravati.

    (ii) The Degree Certificate in the prescribed from signed by the Honorable Vice- Chancellor of S. G. B. Amravati University, Amarvati.

Syllabus of
First Year M. Sc. (Computer Science)

Semester I

Course Code	**17MSC101**
Course Name	**Digital System Design & Microprocessor**
Course Short Name	**DSDM**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Students should know the number system, logic gates, flip-flops etc.
- They should know the details about digital electronics.
- Student should know the evolution stages of microprocessors.

Course Objectives:

- The main objective is to make students aware about the basic concept of digital electronics.
- Student will understand the architecture of advance microprocessor.
- Objective of syllabus is to increase the assembly language programming knowledge of student.

Units	Contents	Total Lectures
I	**Basics of digital electronics :** Digital and analog system , voltage profile , functions of digital logic ; Arithmetic operations , 1's and 2' s compliment method, multiplication by shift and add method, multiplexer as encoding , de multiplexer as decoder, counting , data transmission , Switching function(logic gates) , Combinational logic, Sequential circuit , flip-flop as a memory cell/latch. Register and Counters; shift register as storage, buffer, Counters; Semiconductor memories : Memory expansion : word size and word length expansion.	12
II	**Microprocessor Architecture:** Microprocessor based personal computer system. Introduction to Pentium processor, Internal Architecture of execution unit of Pentium processor, coprocessor/F.P. unit, cache memory, speed. Software model/programming model, Processor flag, superscalar and pipelining, branch prediction, Real mode & protected mode of Pentium.	12
III	**Instruction set :** Pentium instruction and programming ; Data transfer group, string manipulation instructions, Arithmetic group, logical group, Bit manipulation group, branch control group, processor control instructions, ALP program based on these instructions.	12
IV	**Advance programming and interrupt :** EXTRN and PUBLIC directives, subroutines and procedures, MACRO design and expansion, memory management, TSR program, interfacing C with ALP, Types of interrupts, interrupt vector table, interrupt processing sequence, number conversion, (ASCII, BCD, Binary), DOS and BIOS function call for keyboard, display, printer. Command line interface.	12
V	**Protected mode operation:** Detection of protected mode, protected mode operation, segmentation, paging, linear address conversion. Protection, Access rights, multitasking, TSS, task switch, Privilege level, function of TLB.	12
	Text Books: 1. AnandKumar,"Switching Theory and logic design", PHI. 2. James Antonakos, "The Pentium microprocessor", PEARSON	
	References : 1. R. P. Jain, "Modern Digital Electronics", Mcgraw Hill 2. Ray and Bhurchundi, "The INTEL Microprocessor Architecture",Mcgraw Hill	

Course Outcomes:

- Ability to understand the basic concept of digital electronics.
- Students can prepare assemble program, driver and control program for devices.
- Students aware about main components of digital system.

Course Code	**17MSC102**
Course Name	**Data Structures and File Design**
Course Short Name	**DSFD**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Knowledge of C and C++

Course Objectives:

- To analyze the algorithms to determine time and space complexity.
- To build and manipulate linear and non-linear data structure, including Stack, Array, Linked list, Queues, Tree and Graphs.
- To be able to Sort, Search and merge data.
- To be able to choose the appropriate data structure to use in solving typical computer science problem.

Units	Contents	Total Lectures
I	**Introduction**, Types of Data Structures: Linear & Nonlinear data structures, Abstract data types. **Arrays:** Linear arrays, Memory Representation of linear Arrays, Operations on Linear Arrays, Multidimensional Arrays, Matrices, sparse matrices, Applications. **Linked List:** Concept, Operations: Insert, Delete, Traversal, Static implementation using Arrays, Dynamic implementation, Doubly Linked list, Circular linked list, Linked list applications: Merging of two linked lists. File structure, File Type, Records, Attribute.	12
II	**Stacks :** Introduction to stack, primitive operation on stack, Stack implementation using arrays and linked list. Stack's applications - Infix, post fix & Prefix expressions, Infix to postfix conversion, evaluation of postfix expression, Recursion. **Queues :** Introduction to queues, Primitive Operations on the Queues, Dqueue, Circular Queue, Priority Queues. **Queue applications:** CPU Scheduling algorithms FCFS, Round Robin algorithm.	12
III	**Searching:** Introduction to Searching and sorting, Concept and need, Linear search, Binary search, Indexed sequential search, **Sorting:** Bubble sort, Insertion Sort, Selection Sort, **Merging:** Merge Sort, Radix Sort, Heap Sort.	10
IV	**Trees:** Terminology and Concepts, Binary Tree. Representation, Linked representation of binary trees, Binary Search Tree, Operations on Binary Search trees: Insert, Delete. Tree Traversals: Preorder, Inorder, Postorder, AVL Search Trees, B Trees. **Graphs:** Terminology and Graph Representation: Adjacency matrix, Adjacency list, Adjacency multi-list, Traversals: Depth first and Breadth first. Minimum spanning tree, shortest path algorithm, topological ordering **Indexing and Hashing:** B-tree indexing, multilevel indexing, B+ tree, Hashing, Collision processing, Bucket hashing, dynamic hashing, Linear Probing, Linear hashing, Extendible hashing.	14
V	**File Concepts:** Files, Types of file : Master file, Transaction file, Work file, Text file, Binary file, Program file, File processing operations : open, close, read, write, seek. **File Organizations:** Sequential organizations, Random Organizations, Linked Organizations, Inverted Files.	12
	Books : 1. Seymour Lipschutz, "Data Structures",Tata McGraw Hill Education Private Limited, NEW DELHI. 2. SartajSahani, "Data structure algorithms and Applications in C++", McGraw Hill	
	References : 1. Tanenbaum, Langsam, Augenstein, "Data structures using C", PHI 2. D. Samanta, "Classic Data Structures", PHI 3. Mark Allan Welss, "Data structure and algorithm analysis in C++",	

	Addison Weslay 4. Bhagat Singh & T.L. Naps, "Introduction to Data Structures" 5. S.B.Kishor, "Data Structures"	

Course Outcomes:

- Ability to evaluate algorithms and data structures in terms of time and complexity of basic operations.
- Ability to analyze algorithms and a algorithm corrections, to describe stack, queue and linked list.
- Knowledge of basic and dynamic data structures.
- Understands searching and sorting techniques

Course Code	**17MSC103**
Course Name	**Object Oriented Programming using JAVA**
Course Short Name	**JAVA**
Total Lectures	**60**
Total Credits	**4**

Prerequisites:

- Students should be familiar with Object Oriented Programming.
- Basic concepts related to programming are required.

Course Objectives:

- To be able to explain and implement basic Programming techniques.
- To learn basics of java language.
- To implement classes, inheritance, interfaces, applets, graphics and AWT.
- To learn handling exceptions.

Units	Contents	Total Lectures
I	**Java Basics:** History, Features, JDK, JVM, Difference between C++ & Java, Structure of Java Program, Data Types, Operators & Expression, Decision Making Statements, Creating Classes & Objects, Constructor, Constructor Overloading, Method Overloading, Use of *new*, *delete*&*this* keywords.	12
II	**Inheritance, Package & Interface:** Implementation of Inheritance, Super & Extended class, Abstract class & methods, Method Overriding, Final variables, methods & classes. Package concept, Creating user defined Packages, Java built-in Packages. Interface concept, Defining & Implementing Interface. Access Protection: public, private & protected.	12
III	**Exception Handling & Multithreading:**Exception concept, types, Using try- -catch, Multiple catch, nested try, use of throw block.String class, String Buffer and StringTokenizer class and its method Multithreading concept, Thread Life cycle, Creating & running threads, threadproperties.	12
IV	**Applet & Graphics:**Applet concept, Applet Life cycle, HTML Applet tag with all attributes, passingparameters to Applet, Displaying it using Applet viewer, Advantages & Disadvantages of Applet Vs Application. Graphics concept, Graphics class, Drawing Lines, Circle, Polygon, Rectangle, Ellipses, Arcs, Working with colors.	12
V	**AWT:**AWT concept, AWT components, Containers, Frames & Panels, Event DelegationModel, Event source & Handler, Event categories, Listeners & Interfaces.	12
	Books: 1. Herbert Schildt, "Complete Reference Java2", TMH	
	References: 1. E. Balagurusamy, "Programming with Java", TMH 2. Dietel & Dietel, "Java How to Program",Pearson 3. D. R. Collaway, "Inside Servlets", Pearson 4. Steven Holzner, "Java2 Programming Black Book", DreamTech Press	

Course Outcomes:

- Ability to identify and implement Object Oriented concepts in programming.
- Skill to write java application programs using OOP principles, applet programming.
- Understanding of the concepts of polymorphism and inheritance principles of Interface, Exception Handling, Applets, Graphics Programming , Java Imaging and Generic Programming

Course Code	**17MSC104**
Course Name	**Data Communication Networks**
Course Short Name	**DCN**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Knowledge of computer network and types of communication network.
- Different network Types and their features.
- Frequency modulation techniques.

Course Objectives:

- To understand the role of Computer Network.
- To learn the Network's OSI Models and different protocols used in its layers.
- To understand the routing and Multimedia Networking.

Units	Contents	Total Lectures
I	**Introduction:** Data communication Network, Component of data communication network, Types of Network, Topologies, Client- Server Model. **Transmission Media:** Copper Wires, Glass Fibers, Radio, Satellite, Geosynchronous, Satellite, Low earth Orbit Satellite array, Microwave, Infrared. **Local Asynchronous Communication:** The need of asynchronous Communication, Baud Rate, Framing, and Error, Full Duplex Asynchronous Communication.	12
II	**Introduction to OSI Model:** Layers of OSI Model. **Application Layer:** Principles of Application-Layer Protocols, The World Wide Web: HTTP, File Transfer: FTP, The Internet's Directory Service: DNS, Internets Directory Services. **Transport Layer:** Transport-Layer Services and Principles, Principles of Reliable of Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control	12
III	**Network Layer and Routing:** Introduction and Network Service Model, Routing Principles, Broadcast and multicast routing, Routing Algorithms **Internet Protocol:** IP Design, IP Addressing, IP Fragmentation, introduction to IPv6.	12
IV	**Link Layer and Local Area Networks:** The Data Link Layer: Introduction, Services, Error Detection and Correction, Multiple Access Protocols and LANs, Ethernet, CSMA/CD,Hubs, Bridges and Switches **Wireless LANs:** IEEE 802.11 wireless LAN's , The Point-to-Point Protocol	12
V	**Multimedia Networking**: Multimedia Networking Applications, Streaming Stored Audio and Video, Protocols for Real Time Interactive Application, Scheduling and Policing Mechanisms, Differentiated Services. **Security in Computer Networks:** Introduction to Network Security, Principles of Cryptography, Authentication, Integrity Key Distribution and Certification, Access Control: Firewalls, Attacks and Countermeasures.	12
	Text Books: 1. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education. 2. Jerry Fitzgerald and Alan Dennis, "Business Data Communications and Networking", Eighth Edition, Wiley Publication, India.	
	References : 1. Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition 2. V. B. Black, "Data Communications and distributed Networks".	

Course Outcomes:

- Student will understand the concept of computer network technology.
- Ability to identify the different types of network topologies and protocols.
- Knlowledge about OSI model, threats in network and Counter measures.

Course Code	**17MSC105**
Course Name	**System Software**
Course Short Name	**SS**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Basics knowledge of computer architecture and C programming.

Course Objectives:

- To understand the relationship between system software and machine architecture
- To understand the process of scanning and parsing.
- To know the design and implementation of assemblers, linker and compiler.
- To have an understanding of loader, system software tools.
- To be able to trace the path of source code to object code and to the executable file.

Units	Contents	Total Lectures
I	**System Software:** Introduction, types of system software, loaders and linkers, Re location, linkage editors, dynamic linking. **Types of Translators:** **Compiler**:Introduction, phases of compilation, lexical analysis, parsing, comparison between Compiler and Interpreter. **Assembler**: basic assembler function, One pass assembler, Two pass assembler, Multi pass assembler.	12
II	**Process Management:** Definition of process state, process state transition, operation on process, PCB, process scheduling, CPU scheduling, Inter process communication, scheduling criteria and algorithms.	10
III	**Memory management:** Swapping, single, multiple partition allocation, compaction, paging, implementation of page table, segmentation, paged segmentation, paged segmentation.**Virtual memory management:** Virtual memory, demand paging, page replacement, page replacement policies, FIFO, LRU algorithm, allocation of frames, thrashing.	12
IV	**Device Management:** The buffer cache, buffer headers, structure of buffer port, retrieval of buffer, buffer allocation, finding buffer, releasing buffer, reading & writing disk block. I/O Hardware, application I/O interface, kernel I/O sub system, Disk scheduling & management, swap-space management.	12
V	**Case study: Linux OS:** Introduction of Linux O.S., Design principle, kernel modulus, process management, scheduling, memory management, file system, Security.	14
	Text Books: 1. A. Silberschatz, P.B. Galvin, "Operating system Concepts", Wiley publication. 2. D.M. Dhamdhere, "System software and operating system". 3. Alfred V. Aho, Jeffery Ullman,"Principle of compiler design". 4. H.M. Dietel, "Operating system" 5. Maurice J. Bech, "The Design of UNIX Operating System".	
	References : 1. A.S. Tananbum, "Operating System", Person Education. 2. William Stallings, "Operating System", Prentice Hall. 3. Crowly, "Operating System", TMH. 4. M. Milankovic, "Operating System", McGraw-Hill.	

Course Outcomes:

- Student will able to understand compilation and execution of a program.
- Understand the system behavior and system architecture. Also how to deal with the error condition.
- Ability to understand how to deal with input output devices properly.
- Knowledge of opensource opearating system i.e. Linux

Course Code	**17MSC106**
Course Name	**Computer Lab 1 (Based on 17MSC102: DSFD)**
Course Short Name	**CL1**
Total Lectures	**45**
Total Credits	**3**
Practical List will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC107**
Course Name	**Computer Lab 2 (Based on 17MSC103: JAVA)**
Course Short Name	**CL2**
Total Lectures	**45**
Total Credits	**3**
Practical List will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC108**
Course Name	**Computer Lab 3 (Based on LINUX & ALP)**
Course Short Name	**CL3**
Total Lectures	**90**
Total Credits	**6**

Prerequisites:

- Students should be aware about high level language "C", Network concept and Messaging.

Course Objectives :

- Students will be able to understand Linux Operating System, Shell programming and use various Network commands.

Sr. No.	Contents
1.	What is Linux, Linux Architecture, System Boot up, Linux system commands; ls, passwd, whoamI, users, vi, cat, wc, cp, mv, rm,cd, pwd, mkdir, rmdir, cd, echo, man, date. File management ; file permission, file access modes; read, write, execute, chmod, chown, chgrp, command, path, pr, mail, ps, kill, Pipes and filters, sort command,
2.	The vi / vim editor, Shell scripting: what is shell, shell commands, defining , using accessing variables, unset, types of variables, Linux shell basic operators, Arithmetic operators (+, -, *, /, %, =, ==, !=), relational(-eq, -ne, -gt, -lt, -ge, -le , Boolean (!, -o, -a,) string operator(=, !=, -z, -n, str), using array, Linux shell decision making; The "if …else", "if..fi", "if ..else, fi", " if..elfi..else..fi", " case..esac" . Linux shell loop; "while", " for", "until", " select", nesting loop, break, continue, I/O redirection, shell function, pass parameter, return values, nested call, Programs on above features. Network command Communication; ping, telnet utility, swrite, talk, msg, sendall.
3.	Solving C programs on Linux environment.

List of ALP programs based on Digital system design & microprocessor (17MSC101)

1. Write an ALP to search for the biggest no. from ten 16 bit nos.
2. Write an ALP to search for the small no from ten 16 bit nos.
3. Write an ALP to search for the given no.
4. Write an ALP to add ten 16 bit nos. store 32 bit sum to memory.
5. Write an ALP to add ten 8 bit BCD nos. Store BCD sum to memory.
6. Write an ALP to sort ten 16 bit nos in ascending order.
7. Write an ALP to to count for even nos and odd nos from given ten 16 bit nos.
8. Write an ALP to count for 1's condition from ten 16 b it nos. store count in array.
9. Write an ALP for multiplication two 8 bit nos. Store 16 bit result in the memory.
10. Write an ALP for division operation.

Syllabus of
First Year M. Sc. (Comp. Sci.)

Semester II

Course Code	**17MSC110**
Course Name	**Database Management System**
Course Short Name	**DBMS**
Total Lectures	**60**
Total Credits	**4**
Prerequisites :	

Course Objectives:

- Understand the role of a database management system in an organization.
- Understand basic database concepts, including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
- Understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, and data object locking and protocols.

Units	Contents	Total Lectures
I	**Introduction:** DBMS, Advantages, View of Data, Database System Applications. **Database-Languages:-** DDL,DML,DCL,TCL. **Overview of Physical Storage Media:** Magnetic Disks, RAID, Tertiary storage. **File Organization**: Organization of Records in Files, **Indexing and Hashing**: Ordered Indices, B+ tree Index Files, B tree Index Files, Static Hashing, Dynamic Hashing.	12
II	**Entity-Relationship model:** ER designs, ER Entities, attributes, relationship and relationship sets. **Relational Algebra:** Select, Project, Set theory, Join, Division. **SQL:** Basic structure, set operations, Aggregate functions, null values, nested sub queries, views, functions, cursors, triggers, stored procedure.	12
III	**Relational Database Design:** Decomposition, Normalization using functional dependencies, Normalization using join dependencies, domain key normal form, and alternate keys approaches to database. Converting ER Model to Relational Model.	12
IV	**Transaction management:-**The ACID properties, transactions and schedules, current execution of transactions, concurrency control. **Integrity Constraints:** Domain constraints, referential integrity.	12
V	**Introduction to Database security:** Access control, Discretionary access control, Mandatory access control. **Intoduction to Advance databases:** Introduction to centralized system, client-server system. **Types of Databases:** Parallel, Distributed, Object Based.	12
	Text Books: 1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concept, Fifth edition, McGraw-Hill, 2006 2. Raghu Ramkrishnan, Johannes Gehrke, Database Management system,Third Edition McGraw-Hill, 2003 3. C. J. Date, An Introduction to Databae system, Third Edition Vol. 1, Narosa publishing House, 1998	
	References: 1. Jeffrey A. Hoffer, Marry B. Presscott, Fred R. McFadden, Modern Database Mangement, Pearson publication, 6th edition.	

	2. Thomos Canolly, Carolyn Begg, Database system-A practical approach to design, Implementation and management, Pearson publication, 4th edition.	

Course Outcomes:

- Ability to describe data models and schemas in DBMS
- Acquire knowledge about the features of database management systems and Relational database.
- Able to use SQL; the standard language of relational databases.
- Ability to understand the functional dependencies and design of the database.

Course Code	**17MSC111**
Course Name	**Mathematical Foundation**
Course Short Name	**MF**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Basic concept of Mathematical Logic, Connective, Knowledge of derivatives, integration, matrix, basic knowledge of data structure like tree, stack, array, queue, etc.

Course Objectives:

- To understand and be able to use fundamental concept of mathematics in computational science.
- To learn understand the basic concept of Mathematical modeling.
- To make students able to apply mathematical and statistical techniques to solve some real life problems.
- To acquire knowledge of Numerical Computation.

Units	Contents	Total Lectures
I	**Mathematical Logic:** Introduction to Discrete mathematics Proposition, Connectives, Conditional and Biconditional Proposition, Normal Forms, Disjunctive and Conjunctive Normal Form and Principles. **Set Theory:** Basic concepts and Notation, Ordered pairs and Cartesian Products. **Relation :** Types of relation, operations on relation, Properties of relation, Hasse diagrams for partial orderings.	13
II	**Function:** Representation of function, Classification of Function, types of function. **Lattice:** Properties of Lattice, Principle of Duality, Properties of Lattices. **Graph Theory:** Introduction to Graph, Matrix representation of a graph, Transport network, Minimal cost flow, Finite state machine with output, Finite state machine with no output.	13
III	**Computer Arithmetic:** Structure of a Computer, Errors in Numerical Computations, Floating-point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences. **Iterative Methods:** Bisection, False position, Newton-Raphson methods, Secant method.	10
IV	**Matrices:** Matrix operations, transpose of matrix, inverse of matrix, rank of a matrix, **Solution of linear system:** Matrix Inversion method, Gaussian elimination Method, Method of Factorization, The Gauss Seidel iterative method	12
V	**Interpolation:** Introduction, Lagrange Interpolation, Difference Tables, Truncation Error in Interpolation, Spline Interpolation, **Numerical Integration:** Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Taylor Series method, Runge-kutta method.	12
	Text Books : 1. T Veerarajan, "Discrete mathematics with graph theory and combinatorics." McGraw Hill Education 2. V. Rajaraman, "Computer Oriented Numerical Methods", Third Edition, PHI.	
	References : 1. Steven C. Chapra, Raymond P. Canale, "Numerical Methods for Engineers", Tata McGraw Hill. 2. M.Goyal, "Computer Based Numerical & Statistical Techniques", ISP 3. J.P.Tremblay, R. Manohar, "Discrete mathematical structures with applications to computer science ", TMH 4. Narsingh Deo ,"Graph theory with applications to engineering and computer science"PHI 5. S. S. Sastry, "Introductory Methods of Numerical Analysis", Fifth Edition, PHI	

Course Outcomes:

- Ability to apply mathematical and statistical techniques to solve some real life problems.
- Students are able to apply mathematical techniques for data analysis.

- Understand the basic principles of sets and operations in sets.
- Model problems in Computer Science using graphs and trees.

Course Code	**17MSC112**
Course Name	**Computer Graphics**
Course Short Name	**CG**
Total Lectures	**60**
Total Credits	**4**

Prerequisites:

- Basic Knowledge about computer system, it's components and function.

Course Objectives:

- To acquire the basic knowledge about Computer Graphics.
- To learn basic knowledge about various algorithms of Computer Graphics.

Units	Contents	Total Lectures
I	**Introduction to Computer Graphics:** Introduction, Types, Characteristics, Application, Advantage, Input Devices, Hard copy devices, Graphics Software, Coordinate Representation, Software Standards, computer graphics metafile, Rendering, Image Resolution.	10
II	**Video Display Devices:** CRT , Raster scan display, Random scan display, Color CRT Monitors, Virtual Reality System **Output Primitives**: Points and Line, DDA Algorithms, Bresenham's Line Algorithm, Circle Generating Algorithms, Midpoint Circle Algorithm **Filled Area Primitives**: Scan Line, Polygon Fill Algorithm, Boundary Fill Algorithm, Character Generation.	14
III	**Attributes of Output Primitives**: Line Attributes, Curve Attributes, Color Table, Area Fill Attributes, Character Attributes, Bundled Attributes **2D Geometric Transformation:** Basic Transformation (Translation, Rotation Scaling).General Pivot Point Rotation, General Fixed Point Scaling, Reflection Shear **2Dimensional Viewing**: Viewing Pipeline, Windows to Viewport Coordinate Transformation.	12
IV	**Clipping**: Point Clipping, Line Clipping, Cohen-Sutherland Line Clipping, Polygon Clipping, Sutherland-Hodgeman Polygon Clipping Text Clipping, Exterior Clipping. **Structure**: Basic Structure Function, Editing Structure Function.	12
V	**GUI and interactive Input Method**: User Dialogue, Logical Classification of Input Devices. Interactive Picture Construction Techniques **Three Dimensional Concepts**: 3Dimensional Display Methods, Polygon Table, Blobby Object, Bezier Curve, B-Spline Curve.	12
	Text Books: 2. Donald Hearn & M.P.Baker: Computer Graphics 2/e(PHI)	
	References: 5. S.Harrington : Computer Graphics : A programming Approach (McGraw Hills) 6. Roger : Procedural Elements for Computer Graphics (McGraw Hills)	

Course Outcomes:

- Ability to draw graphics using line, curves, and polygon.
- Ability to perform operations on computer graphics.
- Knowlegde about 2Dimentional and 3Dimentional display methods.

Course Code	**17MSC113**
Course Name	**Artificial Intelligence and Expert System**
Course Short Name	**AIES**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Basic Knowledge of search techniques, logic & reasoning.

Course Objectives:

- To understand the Concepts of Artificial Intelligence & Expert System.
- To Study & understand role of knowledge in AI & its representation.
- To understand Applications & research areas of AI.
- To understand Expert Systems.

Units	Contents	Total Lectures
I	**General Issues and overview of AI:** The AI problems: what is an AI technique, Characteristics of AI applications, Problem Solving, Search and Control Strategies, General Problem solving, Production systems; Control strategies, forward and backward chaining, **Exhaustive searches**: Depth first and Breadth first search.	12
II	**LISP:** Introduction to LISP, Syntax and numeric functions, Basic list manipulation functions in LISP, Functions, Predicates and conditionals, Input Output and local variables, Iteration and recursion, property list and array.	12
III	**Learning:** Definitions, Types of learning, A paradigm of Learning, Classification of Learning Strategies, Model for Machine Learning, Learning Framework, Genetic Algorithm. **Knowledge Representation**: Knowledge Representation Issues, Approaches to knowledge Representation, Representing simple facts in logic, Procedural vs declarative knowledge, forward vs Backward Reasoning matching.	12
IV	**Heuristic Search Techniques**: Hill climbing, Branch and Bound technique, Best first search and A* algorithm, AND/OR Graphs, Problem reduction and AO* algorithm, Constraint Satisfaction problems, Game Playing Min Max Search procedure, Alpha-Beta cutoff; Additional Refinements. Applications of Search techniques	12
V	**Reasoning:** Monotonic and non-monotonic reasoning, limitations, Default reasoning, circumscription, Probability theory, Probability based reasoning and uncertainty. **Expert Systems**: Introduction to Expert Systems, Architecture of Expert Systems, Expert System Shells, Knowledge Acquisition, Case Studies.	12
	Text Books: 3. Foundations of AI and Expert sytems: V.S. Jankiraman, K.kureshi, P.Gopal Krishnan (Macmillan series). 4. Introduction to AI and Expert systems: Dan W. Patterson, PHI	
	References : 3. AI and Intelligent Systems: N.P.Padhy, Oxford. 4. Artificial intelligence A Practical approach: Er. Rajiv Chopra (S.Chand)	

Course Outcomes:

- Knowledge of AI and expert system.
- Know the concept List Processing, Knowledge representation.
- Applications of AI for designing the expert system.

Course Code	**17MSC114**
Course Name	**Parallel and Distributed Computing**
Course Short Name	**PDC**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Student must have the basic knowledge of computer architecture.
- Basic knowledge of computer processing.

Course Objectives:

- To provide students with contemporary knowledge in parallel and distributed systems.
- To equip students with skills to analyze and design parallel and distributed applications.
- To provide master skills to measure the performance of parallel and distributed algorithms.

Units	Contents	Total Lectures
I	**Parallel Computing:** Parallel Architecture, Architectural Classification Scheme, Performance of Parallel Computers, Performance Metrics for Processors, Parallel Programming Models, Parallel Algorithms.	12
II	**Pipeline Processing:** Introduction, Pipeline Performance, Arithmetic Pipelines, Pipelined Instruction Processing, Pipeline Stage Design, Hazards, Dynamic Instruction Scheduling.	12
III	**Synchronous Parallel Processing:** Introduction, Example-SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, Data Mapping and memory in array processors, Case studies of SIMD parallel Processors.	12
IV	**Introduction to Distributed Systems:** Definition, Issues, Goals, Types of distributed systems, Distributed System Models, Hardware concepts, Software Concept, Models of Middleware, Services offered by middleware, Client Server model.	12
V	**Communication:** Layered Protocols, Remote Procedure Call, Remote Object Invocation, Message Oriented Communication, Stream Oriented Communication.	12
	Text Books: 6. Advanced Computer Architecture (A Practical Approach) by Rajiv Chopra. 7. Introduction to the Parallel Processing by M.Sasikumar, Dinesh Shikhare and P.Ravi Prakash.	
	References : 5. Fundamental of Parallel Computing by Sanjay Razdan. 6. Introduction to Parallel Computing by Ananth Grama, Anshul Gupta , George Karypis, Vipin Kumar.	

Course Outcomes:

- Ability to develop Parallel application using parallel programming model and algorithms.
- Know the concept of pipeline processing.
- Ability to develop distributed application by using RPC, RMI Technology etc.

Course Code	**17MSC115**
Course Name	**Computer Lab 1 (Based on 17MSC110: DBMS)**
Course Short Name	**CL1**
Total Lectures	**45**

Total Credits	**3**
Practical List will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC116**
Course Name	**Computer Lab 2 (Based on 17MSC112: CG)**
Course Short Name	**CL2**
Total Lectures	**45**
Total Credits	**3**
Practical List will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC117**
Course Name	**Computer Lab 3 (Based on .NET Technology)**
Course Short Name	**CL3**
Total Lectures	**90**
Total Credits	**6**
Prerequisites : • Knowledge of OOP concepts and Web application, • Various scripting languages : VBScript, JavaScript • Knowledge of C# Language: Variables, Data Types, Operators, Converting between Data	

Types, Constants, Introduction to Classes, Objects and Methods.

Course Objectives

- To learn the fundamentals of designing, deploying and implementing Web applications.
- Use different server controls to create interactive web sites.
- Use different techniques of State Management.
- Access data from the database in data bound controls on the web page.
- To be able to use disconnected and connected ADO.Net objects.
- To learn the C# fundamentals and handling files.
- Create Web services
- To learn Crystal Reports, Ajax, Jquery, Silverlight, Sharepoint, WCF, WPF, WF, MVC

Sr. No.	Contents
1.	**Basic Web Controls** (Textbox, Buttons, Imagebuttons, LinkButton, Hyperlink, DropDownList, ListBox, RadioButtonList, CheckBoxList, BulletedList, FileUpload, etc.), **Rich Controls** (Calendars, Ad Rotators), **Validation Controls** (Required Field, Comparison, Range, RegularExpression, Custom, Compare, ValidationSummary), **Navigation Controls** (TreeView, Menu, SiteMapPath), **Login Controls** (CreateUserWizard, Login, LoginStatus, LoginName, ChangePassword).
2.	Creating namespace, ASP.Net Core objects, State Handling (Application State, Session State, ViewState). Introduction to ADO.NET, Connected & Disconnected Data objects. Using SQL Stored Procedures, Working with XML.
3.	Using Data Controls like Datagrid, Repeater, Datalist.
4.	Working with File System (Using Files, Directories and Serialization), Building and using Web Service, Debugging and Error Handling, Deployment.
5.	Introduction to Crystal Reports, Ajax, Jquery, Silverlight, Sharepoint, WCF, WPF, WF, MVC.
6.	
	Text Books : 1. Beginning ASP.NET using C#, Wrox, Authors: Chris Ullman Chris Goode, Juan T. Llibre, Ollie Cornes 2. ASP.NET 2.0 Black Book, dreamtech Press, Authors: Charul Shukla, Anil Kumar Barnwal 3. The Complete Reference C#, Tata McGrawl - Hill, Author: Herbert Schildt 4. ASP.NET 2005 using C#, BPB publications 5. Magic of ASP.Net with C#, Firewall Media, Authors: Shibi Panikkar, Kumar Sanjeev
	References : 1. .NET Framework Essentials, OREILLY, Authors: Thuan Thai & Hoang Q. Lam 2. ADO.NET Cookbook, O'REILLY, Author: Bill Hamilton 3. Learning C#2005, Second Edition, Oreilly, Authors: Jesse Liberty, Brian MacDonald

Shree H. V. P. Mandal's

Degree College of Physical Education, Amravati.

(Multi-faculty Autonomous College)

FACULTY OF SCIENCE AND TECHNOLOGY

(SCIENCE GROUP)

CURRICULUM SCHEME AND

SYLLABUS OF

SECOND YEAR

MASTER OF SCIENCE (COMPUTER SCIENCE)

(Choice Based Credit System)

Program Code: MSC2017

Introduced from the Session 2017-2018

Degree College of Physical Education,

(Multi-faculty Autonomous College)

SPECIAL NOTE FOR THE STUDENTS

1) This is notified for general information and guidance of all concerned for admission and examination to Master of Science in Computer Science.

2) All the students desirous to take examinations for which this prospectus has been prescribed should if found necessary for any other information regarding examinations etc. refer the examination rules of this autonomous college.

Pattern of Question Papers for Semester/Final Examinations of

MSc Programme in Choice Based Credit System

For Theory Examination

7. Under the CBCS curriculum, the semester/final theory examination shall be conducted for each course (Subject) as per the schedule declared by the Examination Section.
8. The question paper shall be of maximum 70 marks, containing ten questions, two questions on each unit and students are required to attempt any one of two.
9. No objective type multiple choices question allowed.
10. Every question will be of fourteen marks and may contain sub questions. Distribution of marks shall be given on the right of each question.
11. The questions' numbering will be as follows: Q. 1: or Q. 2:, Q. 3: or Q. 4:, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q.10

12. The question shall be target to evaluate knowledge, skill, thinking ability and application. Weightage shall be given in decreasing order of Knowledge, thinking ability, application and skill.

For Practical Examination

5. Question paper for practical examination will be of 20 Marks, two questions of ten marks each.
6. Question number one shall contain six problems/programs/experiments and student attempt any two out of these questions.
7. Question number two contain two sub questions (a) and (b) each of five mark.
8. Question number 2(a) contain five MCQ. Question number 2(b) contain one logical question/problem to test students' ability of solving problems (Setter may ask to solve real life problems based on case study)

Examination Leading to the

Degree of Master of Science

(Computer Science)

(Bi-annual Pattern)

(Two Year Course)

Whereas, it is expedient to prepare a new rule for Examination leading to the Degree of Master of Science (Computer Science) (Bi-annual) (Two Year Course) under CBCS for the purposes hereinafter appearing in the Academic Board and Board of Management.

20. This Rule may be called "Examination Leading to the Degree of Master of Science (Computer Science) (Bi-Annual Pattern) (Two Year Course) CBCS.
21. This rule shall come into force w.e.f. the Session 2017-18 for the Degree of Master of Science (Computer Science) (Bi-Annual Pattern) (Two Year Course) under CBCS.
22. Subject to their compliance with the provisions rules in force from time to time. The following person shall be eligible for admission to M.Sc. first year (Computer Science).
    a) A person who has passed the degree of Bachelor of Science of any statutory University with Computer Science / Computer Application as one of the subjects.

    OR

    b) A Person who has passed B.A. / B.Sc. with Mathematics plus post Graduate Diploma in Computer Science of S.G.B. Amravati University.

    OR

    c) A person who has passed a Degree of bachelor of Computer Science.
23. A person who has passed M.Sc. First Year Computer Science of this Autonomous college or any other affiliated colleges of S.G.B. Amravati University shall be eligible for admission to M.Sc. Second Year (Computer Science).
24. The Degree of Master of Science (Computer Science) shall be awarded to an examinee who, in accordance with the provisions of this rule qualifies for the degree.
25. Duration of the Programme shall be two academic Years. The First Year M.Sc. (Computer Science) divided into two semesters called as Semester I, Semester II. The Second Year M.Sc. (Computer Science) also divided into two semesters called as Semester III and Semester IV. The College shall hold Examination in Winter and in Summer every year for both the even and odd semester.
26. The regular Examination of Semester–I and Semester- III shall be conducted in winter & the regular Examination of Semester- II and Semester- IV shall be conducted in summer every year. Supplementary Examination for Semester– I and Semester- III shall be held in summer and the supplementary examination for Semester–II and Semester-IV shall be

held in winter every year.

27. For purpose of instructions and Examinations the students shall study sequentially.
28. The period of academic session / term shall be such as may be notified by this Autonomous College.
29. The Examinations as given in Para – 7 above shall be held at such dates as may be notified by this autonomous college.
30. Subjects to his/her compliance with the provision of this rule and of other rules pertaining to examinations in force from time to time the applicant for admission at the end of the course of study of a particular term shall be eligible to appear at it, if,

(iv) He/She satisfied the conditions in the table and the provisions there under.

(v) He/She has prosecuted a regular course of study in this college.

(vi) He/She has in the opinion of the Head of the Department/Principal shown satisfactory progress in his / her studies.

Sr. No	Course and Level	Type of Admission	Eligibility	Remark
1	MSc Semester-I	Direct Admission	As mentioned in Para-3	
2	MSc Semester-II	Natural Growth	---	
3	MSc Semeste-III	Natural Growth	Having Passed Minimum 50% of total passing heads collectively of MSc Semester-I and Semester-II	
5	MSc Semester IV	Natural Growth	---	

31. The papers and practical in which an examinee is to be examined. The maximum marks for these and the minimum pass marks which an examinee must obtain in order to pass in the subject and the examination shall be as per the curriculum.
32. (i) The scope of the subjects is as indicated in the syllabus.
    (ii) The Medium of instruction and examination shall be English.
33. There shall be no classification of examinees successful in M.Sc. Semester –I, M.Sc. Semester–II, M.Sc. Semester-III and M.Sc. Semester-IV examination separately.
34. Examinees those who are successful in M.Sc. (Computer Science) Semester-IV Examination and all other three previous Semester examinations shall be declared passed and CGPA and programme grade will be computed as per the provision and rules of examinations under CBCS for this autonomous college.
35. An examinee who does not pass or who fails to present himself herself for the examination

shall be eligible for readmission to the same examination, on payment of fresh fees and such other fees as may be prescribed.

36. As soon as possible after the examinations the Examination Committee shall publish a result of the examinees. The result of final M.Sc. Examination shall be declared as mentioned in para-15 above and merit list shall be notified as per the rules.
37. Notwithstanding anything to the contrary in this rule no one shall be admitted to an examination under this rule, if he/ she has already passed the same examination or an equivalent examination of any statutory University.
38. (i) The examinees who have passed in all the subject prescribed for all the examinations shall be eligible for award of the Degree of Master of Science (Computer Science) by S. G. B. Amravati University, Amravati.

    (ii) The Degree Certificate in the prescribed from signed by the Honorable Vice- Chancellor of S. G. B. Amravati University, Amravati.

This page is for Curriculum Scheme for SYMSC Semester-III

This page is for Curriculum Scheme for SYMSC Semester-IV

Second Year M. Sc. (Computer Science) Semester -III

Course Code	**17MSC201**
Course Name	**Software Engineering**
Course Short Name	**SE**
Total Lectures	**60**
Total Credits	**4**

Prerequisites:

- Basics concepts of System Development Life Cycle.

Course Objectives:

- To Study software engineering methods, models and Processes.
- To learn the concepts of software products and software processes.
- To explain the importance of process visibility.
- To introduce the notion of professional responsibility.

Units	Contents	Total Lectures
I	**Software Engineering Fundamentals:** Evolving role of Software. Software crises & myths. Software Engineering. Software process & process models: Waterfall, incremental, Spiral, WINWIN spiral, Evolutionary, Prototyping, Object Oriented, RAD model. Product &Process. Project management concepts : People, Product, Process, Project. WSHH principle.	12
II	Measures, Metrics & Indicators. Metrics for software quality,. Software projects Planning: Scope, resources, estimation, decomposition technique, Tools. Software risks : identification, risk projection, refinement & RMMM plan.	12
III	**Project Scheduling**: Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control.SCM standard.	11
IV	**System engineering**: Hierarchy, Business Process & Product engineering: Requirement engineering, System modeling. Software prototyping. Design Process. Design Principles & Concepts. Design model & documentation. Software architecture, Architectural styles. User-interface design: Golden Rule. **Software testing fundamentals**: Test case design, White box testing. Basis path, control structure-, Black box-Testing, &for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.	13
V.	**Web Engineering**: Attributes of web-based systems and applications. WebApp Engineering Layers: Process, Methods, Tools and technology	12

	Web engineering process: Defining the framework, refining the framework. **Reverse Engineering**: Process, Reverse engineering to understand data, processing & user Interfaces.	
	Textbook : 1. Pressman Roger. S.: Software Engineering, A Practitioner's Approach TMH 2. Somerville : Software Engineering (Addison-Wesley) (5/e) 3. Software Testing in Real World by Edward Kit	
	References : 1. Fairly R. : Software Engineering (McGraw Hill) 2. Davis A. : Principles of Software Development (McGraw Hill) 3. Shooman, M.L. : Software Engineering (McGraw-Hill) 4. Pankaj Jalote : An Integrated approach to Software Engineering, 3rd edition Narosa Publications	

Course Outcomes:

- Ability to compare and chose a process model for a software project development.
- Analyze and model a software system.
- Test a software system.

Course Code	**17MSC202**
Course Name	**Cloud Computing**
Course Short Name	**CC**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Knowledge of Operating Systems and Database.
- Knowledge of Virtualization and Networking.

Course Objective:

- To study cloud computing concepts and models.
- To study the technologies required for Cloud Computing.
- To study the applications that uses cloud computing.

Units	Contents	Total Lectures
I	**Basic Concepts:** Introduction cloud computing, History, Working, Benefits, Characteristics, Application, and Deployment Models: public, private, hybrid, Service Model: SAAS, PAAS, IAAS, Cloud Computing Architecture, Cloud infrastructure.	11
II	**Cloud Computing Technologies:** Parallel vs. distributed computing, Elements of parallel computing: Hardware architectures for parallel processing, Approaches to parallel programming, Laws of caution, and Elements of distributed computing: definition, component, Grid Computing, Utility Computing.	13
III	**Virtualization:** Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology example: VMware: full virtualization.	10
IV	**Concurrent Computing:** Anatomy of the Aneka container, Introducing parallelism for single-machine computation , Programming applications with threads: introduction Thread API's ,Domain decomposition, Functional Decomposition, Multithreading with aneka: Model, Interface Compellability, life Cycle ,Programming applications with aneka threads.	14
V	**Storage in Cloud:** Storage system architecture, Big data, Virtualized data centre(VDC) architecture, VDC Environment, server, storage, networking, desktop and application virtualization techniques and benefits, **Cloud file systems:** GFS and HDFS, BigTable, HBase and Dynamo. Features and comparisons among GFS,HDFS.	12
	Text Books: 3. Rajkumar Buyya, "Mastering Cloud computing", McGraw Hill 4. Rajkumar Buyya, "Cloud computing principles and paradigms", Wiley	
	References : 3. Gautam Shroff, Enterprise Cloud Computing, Cambridge	

	4. Dr. Kumar Saurabh, "Cloud Computing", Wiley Publication 5. Greg Schulr, "Cloud and virtual data storage networking", CRC Press 6. Barrie Sosinsky, "Cloud Computing", Wiley India	

Course Outcomes:

- Ability to deal with cloud computing environment.
- Understanding of modern computing technologies and storage technologies in distributed environment.

Course Code	**17MSC203**
Course Name	**Design and Analysis of Algorithm**
Course Short Name	**DAA**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Basic knowledge of Data Structure, Set theory.

Course Objective:

- To introduce basic concepts of algorithms.
- To introduce mathematical aspects and analysis of algorithms.
- To introduce algorithm design methods.
- To introduce various algorithmic techniques.

Units	Contents	Total Lectures
I	Introduction: Algorithms, Analysis of Algorithms, Space and Time complexity of algorithms, Asymptotic Notations, Recurrences and their solution methods, Amortized analysis.	10
II	Sorting networks, comparison networks, biotonic sorting network, Advanced Data structure like Red Black Tree, Disjoint Set structure, Fibonacci Heap, Divide and conquer basic strategy: binary search, quick sort, merge sort, Strassen's Matrix multiplication,	11
III	Advanced Design and Analysis Techniques: Greedy Algorithm: Minimum spanning tree (Kruskal's and Prim's Algorithm), Single Source shortest path(Dijkstra's Algorithm), Dynamic Programming: All Pairs shortest path (Floyd Warshall Algorithm), Optimal Binary search tree, Travelling salesman problem.	14
IV	Tree traversal techniques : In order, Preorder, Post order, Breadth First Search, Depth first Search, Backtracking : N-Queen Problem, Graph coloring, Hamiltonian cycle, Knapsack Problem	13
V	NP-completeness: The classes P and NP, NP-complete problem, NP-Hard Problem, Approximation algorithm: Vertex cover problem, travelling salesman problem, set-covering problem.	12
	Text Books: 1. Ellis Horowitz, Sartaj Sahani, Sanguthevar Rajasekaran "Fundamentals of Computer Algorithms" Second Edition Universities Press 2. Chandra Mohan "Design and Analysis of Algorithms" Second Edition PHI	
	References : 1. Gilles Brassard, Paul Bratley "Fundamentals of Algorithms" PHI. 2. Sara Baase, Allen Van Gelder "Computer Algorithms Introduction to design and Analysis", Pearson. 3. Donald E. Knuth "Fundamentals Algorithms" Third edition.	

Course Outcomes:

- Designing of algorithms using different strategies.
- Ability to analyze the algorithms.
- Knowledge of optimization of solutions of a problem.

Course Code	**17MSC204**
Course Name	**Advanced Web Technology**
Course Short Name	**AWT**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Knowledge of HTML.
- Fundamentals of designing & hosting the websites.

Course Objective:

- Web Site Designing and Development using Open Source Technologies.
- To learn the scripting languages.
- To learn the creation of dynamic websites using Open source databases.

Units	Contents	Total Lectures
I	Web basics, Multitier Application Architecture, Client-Side Scripting versus Server-Side Scripting, World Wide Web Consortium (W3C). **HTML5**: Features, Editing, HTML5 structure, Headings, Linking, Images, Lists, Tables, Forms. **HTML5 New Elements**: **Form input type element**: colors, date, time, e-mail addresses, numbers, range, search, telephone numbers, URLs, **Data list Elements**. **Page-Structure Elements**: header, nav, figure, fig caption, article, summary, details, section, aside, meter, footer. **Audio & Video elements.**	12
II	**CSS**: Introduction, **basic properties**: text, list, border font, **Selectors**: universal, type, id, class. **CSS types**: Inline, Internal and External Style Sheets. **Introduction:** PHP and open source. **Overview of PHP**: Features, PHP HTML embedding tags and syntax, simple script examples, PHP variables, operators, data types.	12
III	**Control Statement in PHP:** If Else, Switch Statements. **Looping Statements** For, While, Do-While, Break statements. **PHP Array:** Array Types: Indexed Array, Associative Array, Multidimensional Array.**PHP Functions:** Introduction to functions, declaring functions, function scope, passing arguments to function, using include files and require statements, mail functions.	12
IV	**Object oriented concepts**: Introduction, basic class definition, visibility, constructors and destructors, static keywords, class constants, inheritance. **File handling in PHP**: Open, Append, Write, Read, Delete. **PHP: String** and String functions, PHP Maths Functions**.**	12
V	**Processing of HTML and PHP:** Adding PHP to HTML or processing HTML form using GET, POST, SESSION, COOKIE variables. PHP File uploads and PHP Downloads File, Exception and Error handling. **Database operations**: Operations with PHP, connecting to Mysql with PHP, selecting a database, building and sending query, SELECT, INSERT, DELETE,	12

	UPDATE**.** **PHP Mysql functions**: mysqli_affected_rows(), mysqli connect(), mysqli close(), mysqli_query(), mysqli_select_db(), mysqli_num_rows() , mysqli_num_fields(),	
	Text Books : 1. Paul Deitel, Harvey Deitel and Abbey Deitel, "Internet & World Wide Web: How to program", Fifth Edition Pearson ISBN 978-0-13-215100-9 2. Thomas A. Powell, "HTML & CSS: The Complete Reference" , Fifth Edition, McGraw-Hill, ISBN: 978-0-07-174170-5 3. Kogent Learning Solutions Inc, HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, Ajax, PHP and Jquery, Dreamtech Press, New Delhi, 2011 4. Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner, Beginning PHP, Apache,MySQL Web development, Wrox Publication. 5. Jason Gerner, Elizabeth Naramore, Morgan L. owens, Matt warden, Professional LAMP: Linux, apache, MySqland PHP5 Web development, Wrox Publication.	
	References : 1. Lynn Beighley, Michael Morrison,Head first PHP and Mysql,Second Edition, Oreilly publication. 2. Luke Weling, Laura Thomas, PHP and MYSQL Web Development, Pearson Education. 3. Tim Converse, Joyce Park, PHP5 and Mysql Bible , Wiley publication **For More reading:** 1. www.w3schools.com 2. www.devguru.com 3. www.javatpoint.com 4. www.tutorialspoint.com	

Course Outcomes:

- Ability to configure text, color, and page layout with Cascading Style Sheets.
- Able to use of images & multimedia on web pages.
- Skill of developing the server and client side programs.
- Skill & knowledge of Web page design using HTML5 and PHP.

Course Code	**17MSC205**
Course Name	**Data Mining**
Course Short Name	**DM**
Total Lectures	**60**
Total Credits	**4**

Prerequisites:

- Basics knowledge of Data and its preprocessing.
- Basic concepts of database management systems.

Course Objectives:

- To study the data preprocessing techniques.
- To learn the Data Visualization and pattern identification.
- To study the Classification, Clustering, and Association analysis.
- Study of advanced data mining techniques.

Units	Contents	Total Lectures
I	**Introduction**: Data Mining Concept,KDD Process ,Architecture of Data mining system, Data Mining Functionalities, Classification of data mining system, Data mining Task primitives, Integration of Data mining with Database or Data Warehouse, Major Issues in Data mining. **Data Preprocessing:** Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.	12
II	**Mining Frequent Patterns, Associations and Correlations:** Basic concepts and Road Map, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.	12
III	**Classification and Prediction**: Introduction, Issues, Comparison, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation. **Prediction:** Linear Regression, Nonlinear Regression, Accuracy and Error Measure, Evaluating the Accuracy of Classifier or Predictor.	12
IV	**Cluster Analysis:** Introduction, Application, Requirement of Clustering, Data type in Cluster Analysis, Categorization of major Clustering methods. Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Base Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint – Based Cluster Analysis.	12
V	Graph Mining, Social Network Analysis and Multi-relational Data Mining, Mining Object, Spatial, Multimedia, Text and Web Data, Applications and Trends in Data Mining	12

	Text Books: 1. J.Han, M.Kamber-Data Mining: Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher. 2. Bharat Bhushan Agarwal ,Sumit Prakash Tayal-Data Mining and Data Warehousing, , Universities Sciences Press 3. Arun K.Pujari-Data Mining Techniques, 2nd Edition, Universities Press.	
	References: 1. David Hand, Heikki Manila, Padhraic Symth "Principles of Data Mining "PHI Publication. 2. Margaret H. Dunham- Data Mining: Introductory and Advanced Topics Pearson Education. 3. PANG-NING TAN, Vipin Kumar, Michael Steinbach "Introduction to Data Mining" 4. Charu C. Agarwal, Data Mining Textbook, Springer Publication.	

Course Outcomes:

- Able to perform Data Preprocessing.
- Ability to perform Descriptive and predictive analysis of data.
- Problem solving and applications of Data Mining.

Course Code	**17MSC206**
Course Name	**Computer Lab 1(Based on 17MSC202 and 17MSC203)**
Course Short Name	**CL 1**
Total Teaching Hours	**45**
Total Credits	**3**
Practical list will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC207**
Course Name	**Computer Lab 2 (Based on 17MSC204 and 17MSC205)**
Course Short Name	**CL 2**
Total Teaching Hours	**45**
Total Credits	**3**
Practical list will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC208**
Course Name	**Computer Lab 3 (Based on Software Testing)**
Course Short Name	**CL 1**
Total Teaching Hours	**90**
Total Credits	**6**
Practical list will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC209**
Course Name	**Seminar**
Course Short Name	**SEM**
Total Teaching Hours	**30**
Total Credits	**2**

Prerequisites

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Course Objectives

- To learn new topics by self learning.
- To study and review the research papers, magazines, etc.
- To develop communication, interpersonal and presenting skills.

Synopsis format:

1. Abstract
2. Introduction
3. Technology focus
4. Future scope
5. Conclusion
6. References

Seminar Report Format:

1. Abstract
2. Introduction
3. Technology Focus
4. Applications
5. Future Scope
6. Conclusion
7. References

Rules:

1. Topic should be based on recent technology.
2. Topic should be research oriented.
3. The topic may be out of the scope of syllabus.
4. Synopsis should submit the synopsis in the given format for approval by the department.
5. Synopsis should not exceed more than 2 pages, it should cover the summery of whole topic in brief.
6. Minimum 10-12 slides presentation should be prepared for seminar.
7. Seminar report should be duly signed by seminar guide.
8. It will be responsibility of guide and students to communicate about selection/rejection/preparation of the topic to each other.
9. Synopsis should be submitted within tipe span specified by Seminar In-charge.
10. Synopsis should be hand written.

Formatting Rules:

a. Paper size A4.
b. Margins all side 1 inch.
c. Line Spacing for final report 1.5
d. Font : Times New Roman
e. Size :
    i. 12 for Normal body of text in the seminar report
    ii. 14 for title and headings in the seminar report
    iii. 9 for footnote and style italic

Course Outcome:

- Ability to learn a new technology and formulate the contents for self learning.
- Able to present the new topic and defend the questions raised.
- Gain self confidence and stage daring.

Second Year M. Sc. (Computer Science) Semester-IV

Course Code	**17MSC210**
Course Name	**Elective 1 (CYBER SECURITY AND ETHICAL HACKING)**
Course Short Name	**ELE1**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Basics information of Viruses and Firewall.
- Basic knowledge of Networking Protocols.

Course Objectives:

- To learn about the importance of information security.
- To understand various hacking techniques and attacks.

Units	Contents	Total Lectures
I	**Security Introduction:** What is cyber Security?, Security Services , Security attacks, Cyber Security Model, Encryption Techniques, Public Key Cryptography, RSA	12
II	**Cyber Security:** System Security – Intruders, Viruses, Threats , Firewalls, Web Security, IP Security, Email Security, PGP, Secure Socket Layer, Transport Layer Security, Digital Signature.	12
III	**Introduction to Hacking**: Introduction to Hacking Phases of an Attack – Types of Hacker Attacks Session Hijacking, Web Server Attacks, Database Attacks, Password Cracking, Network Devices & Attacks, Wireless Network Attacks, Trojans , Buffer Overflows, Denial of Service Attacks, Social Engineering Attacks, Physical Penetration Attacks.	12
IV	**Session Hijacking: Introduction**: Spoofing vs Hijacking, Steps in session hijacking, Sequence number prediction, Session Hijacking Tools. **Hacking Web Servers :** Introduction, Sources of Security vulnerabilities in Web Server, Attacks against Internet Information Services ,	12
V	**Web Application Vulnerabilities**: Web Application Threats, Tools**, SQL injection**, SQL Injection Techniques, Preventing SQL Injection Attacks, Tools.	12
	Text Books: 1. Cryptography and Networking Security Principles & Practice (fourth edition) Willam Stallings 2. The fundamentals of New Security - John F. Chavwan, Artch. House 3. Ec-Council, "Ethical Hacking and Countermeasures: Attack Phases", Delmar Cengage Learning, 2009.	

	4.Naina Godbole, Sunil Belapure, "Cyber Security-Understanding Cyber crime, Computer forensic and legal perspective", Wiley India Pvt. Ltd.	
	References : 1. Michael T. Simpson, Kent Backman, James E. Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning, 2012. 2. Ankit Fadia " Ethical Hacking" second edition Macmillan India Ltd, 2006	

Course Outcomes:

- Understanding of system security and cyber security.
- Knowledge of different attacks.
- Use of different tools for hacking, hijacking and web vulnerability.

Course Code	**17MSC210**
Course Name	**Elective 1(Computer Oriented Optimization Techniques)**

Course Short Name	**ELE1**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Knowledge and applications of Numerical methods, Statistical method.

Course Objectives:

- To study the concept of Project Management.
- To Learn Critical Path Approach.
- To Learn System Integration, Cost Benefit Analysis and improve productivity.

Units	Contents	Total Lectures
I	**Introduction of Operation Research (OR):** Definition, Advantages of OR. Classification Model of OR, Applications and Limitations Of OR, General Methods For Solving OR Model. **LPP**: Introduction, Characteristics, Mathematical Formulation, Graphical Solution Method, Limitation Of Graphical Method, Artificial Variable, Slack Variable, Surplus Variable, Simplex Method. Duality In Linear Programming.	11
II	**Transportation Model**: Definition, Formulation, Balance And Unbalance Problem: North West Corner Method, Least Cost Method, Vogel's Approximation Method Row Minima Method And Column Minima Method. **Assignment Model:** Definition, Formulation, Hungarian Method.	10
III	**Decision Theory:** Definition, Decision Making Environment Certainty, Uncertainty: Maximax Criterion, Laplace Criterion, Hurwicz Alpha Criterion, Maximin Criterion, Minimax Criterion, Risk: EVM, EOL, EVPI. Bayes Decision Theory, Decision Trees. **Game Theory:** Terminology, Two-Person Zero-Sum Game, Pure Strategies (Minimax And Maximin Criterion), Game With Saddle Points, Mixed Strategies, Rules Of Dominance, Graphical Method.	14
IV	**Sequencing Problem:** Notation Terminology, Processing N Jobs Through Two M/C, Three M/C, Two Jobs Through Three M/C, N Jobs Through M M/C., Salesman Problem. **Queuing Theory:** Introduction, Basic Structure, Component, Queuing Costs, The Managerial Problems. **Simulation:** Introduction, Steps Of Simulation Process, Advantages N Limitation, Application Of Simulation To Queuing Theory.	13
V	**PERT & CPM:** Introduction, Difference Between PERT and CPM, Application, Basics Steps, Network Diagram Representation, Rules for Drawing a network, CPM: Terminology, Backward Pass. PERT Estimation, Advantage and limitation of PERT And CPM.	12
	Text Books: 1. "Operation Research " by Hira and Gupta 2. "Operation Research " by Anand Sharma Taha Publication	

	References : 1. "Operation Research " by Shridhar Bhat 2. "Operation Research " by Natrajan Taha Publication	

Course Outcomes:

- Knowledge of various techniques of operations research
- Ability to solve real life problems using methods of Operation Research.
- Knowledge of selecting an optimum solution with profit maximization.

Course Code	**17MSC210**
Course Name	**Elective-1: Soft Computing**
Course Short Name	**Ele1**
Total Lectures	**60**
Total Credits	**04**

Prerequisites :

- Knowledge of AI, Linear Algebra and Calculus, Probability theory.

Course Objective:

- To solve complex real-world problems using soft computing techniques.
- To recognize the feasibility of applying a soft computing methodology for a particular problem.
- To design, analyze and perform experiments using soft computing techniques.

Units	Contents	Total Lectures
I	**Soft Computing:** Introduction, Hard Computing and Soft Computing, Constituents of Soft Computing: Conventional AI to Computational Intelligence, Neural networks, Fuzzy set theory, Evolutionary Computation. Introduction to Hybrid systems, Neuro-Fuzzy and soft computing characteristics.	10
II	**Neural Network**: Introduction, Advantages, Applications, Fundamental Concept, Basic model of artificial neural network, McCulloch-Pitts Neuron, Linear separability, Hebb Network.	12
III	**Supervised Learning Networks:** Introduction, Architectures of: Percepteron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons, Back propogation Network. **Unsupervised Learning Networks:** Introduction, Architectures of: Fixed weight competitive nets (Maxnet, Mexican Hat, Hamming), Kohonen self-organizing feature maps, Learning Vector Quantization, Counter propagation networks (Full & Forward only).	14
IV	**Fuzzy Logic:** Introduction, Fuzzy sets, Fuzzy relations, Fuzzy arithmetic and Fuzzy measures, Fuzzy Rule base and approximate reasoning: Introduction, Truth values & Tables in Fuzzy logic, Fuzzy propositions, Formation of rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Fuzzy Reasoning. Fuzzy decision making.	12
V	**Genetic Algorithm:** Introduction, Traditional Optimization and Search Techniques, GA and search space, Difference of Genetic Algorithm and Traditional methods, Simple genetic algorithm, General GA, Operators in Genetic Algorithm: Encoding, Selection, Crossover and Mutation. Problem solving using genetic algorithm, Advantages & Limitations of GA, Applications of GA.	12
	Text Book : 1. Dr. S. N. Sivanandam, Dr. S. N. Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Ltd. 2. Samir Roy, Udit Chakraborty, "Introduction to soft computing Neuro-Fuzzy and Genetic Algorithms", Pearson.	

	3. S. R. Jang, T. Sun, E. Mizutani, "Neuro-Fuzzy and Soft Computing A Computational Approach to Learning and Machine Intelligence", PHI Learning Private Ltd.	
	Reference Books: 1. Satish Kumar, "Neural Networks A Classroom Approach", Tata McGraw-Hill Education Pvt. Ltd. 2. Simon Haykin, "Neural Networks and Learning Machines", Third Edition, PHI Learning Private Ltd. 3. M. Ganesh, "Introduction to Fuzzy Sets and Fuzzy Logic", PHI Learning Private Ltd. 4. John Yen, Reza Langari, "Fuzzy Logic Intelligence, Control and Information", Pearson Education. 5. David E. Goldberg, "Genetic Algorithms in Search, Optimization & Machine Learning", Pearson Education.	

Course Outcomes:

- Ability to solve complex real-world problems using soft computing techniques.
- Conceptualize fuzzy logic & its implementation for various real world applications.
- Derive the mathematical background to carry out optimization using genetic algorithms.

Course Code	**17MSC210**
Course Name	**INTERNET OF THINGS**
Course Short Name	**IOT**
Total Lectures	**60**
Total Credits	**4**

Prerequisites :

- Knowledge of internet, sensors and sensor network.

Course Objectives:

- To study the RFID Technology, Sensor Technology and Satellite Technology.
- To study the resource management and security issues in Internet of Things.
- To study the application areas of Internet of things.

Units	Contents	Total Lectures
I	**MOBILE COMPUTING AND SENSOR:** Adhoc Network and Mobile Information exchange, Mobile Application of Smart computing and self monitoring Technologies, Radio Frequency Identification Technology for Tracking, Wireless Sensor Network for Environmental Monitoring, Wireless networking and collaborative communication. **IOT INTRODUCTION:** What is the Internet of Things? : History of IoT, About IoT, Overview and Motivations, Examples of Applications, Internet of Things Definitions and Frameworks : IoT Definitions, IoT Architecture, General Observations,	12
II	**FUNDAMENTAL IoT MECHANISMS AND KEY TECHNOLOGIES:** Identification of IoT Objects and Services, Structural Aspects of the IoT, Environment Characteristics, Traffic Characteristics, Scalability, Interoperability, Security and Privacy, Open Architecture, Key IoT Technologies, Device Intelligence, Communication Capabilities, Mobility Support, Device Power, Sensor Technology, RFID Technology, Satellite Technology	12
III	**EVOLVING IOT STANDARDS :** Overview and Approaches, MQTT Protocol, Representational State Transfer (REST), ETSI M2M, IP in Smart Objects (IPSO) **Signal Conditioning Units:** Sensors(Temperature Sensor, Pressure Sensor, Motion Control Sensor, Soil Moisture Sensor, Ultrasonic Range Sensor), Gateway (Raspberry PI, Arduino, Its Difference), Actuators	12
IV	**WIRELESS TECHNOLOGIES FOR THE IoT: WPAN Technologies for IoT/M2M**: Zigbee/IEEE 802.15.4, Radio Frequency for Consumer Electronics (RF4CE), Bluetooth and its Low-Energy Profile, Comparison of WPAN Technology. **Cellular and Mobile Network Technologies for IoT/M2M:**Overview and Motivations, Universal Mobile Telecommunications System, LTE	12
V	**INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE:** Vulnerabilities of IoT, Security requirements, Threat analysis, Use cases and misuse cases, IoT security tomography and layered attacker model, Identity	12

	establishment, Access control, Message integrity, Non-repudiation and availability, Security model for IoT.	
	Text Books: 1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Willy Publications 2. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things",	
	References : 1. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" Willy Publications 2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, , 2nd Edition, Willy Publications 3. Daniel Kellmereit, Daniel Obodovski, "The Silent Intelligence: The Internet of Things",. Publisher: Lightning Source Inc; 1st edition (15 April 2014).	
Course Outcomes: • Understanding of Internet of Things. • Knowledge of Key technologies and standards used in IoT. • Security and governance in IoT.		

Course Code	**17MSC211**
Course Name	**Image processing**
Course Short Name	**IP**
Total Lectures	**60**
Total Credits	**04**

Prerequisites :

- Basic knowledge in Computer Graphics.
- Knowledge of digital Image and related terms.
- Knowledge of representation formats of digital images.

Course Objectives:

- To study the image enhancement techniques.
- To study image restoration procedures.
- To study the image compression procedures.
- To study the image segmentation and representation techniques.

Units	Contents	Total Lectures
I	**Image fundamentals** :Introduction, application, fundamental steps, component, Dimensions of image, Different Dimensions of Image signal, Types of image, Image Sampling and Quantization, Basic relationship between pixels: Neighbor of pixel, Connectivity	10
II	**Image transformation and Enhancement:** Introduction to Fourier transform, discrete Fourier transform, Walsh transformation, Hadamard transformation, Introduction to Enhancement, Spatial domain method, frequency methods, Spatial filtering: Smooth & Sharpening, low pass and high pass.	13
III	**Image Restoration**: Introduction, Degradation model, algebraic approach to restoration, Unconstrained restoration, Constrained restoration **Segmentation**: Introduction to image segmentation: point, line edge detection, Thresholding, Regions Based segmentation, Edge linking and boundary detection	13
IV	**Compression**: fundamentals, Image compress models, Huffman coding, run length coding, lossless predictive coding, Lossy predictive coding, compression standard: JPEG **Color Model:** RGB,CMY,HIS, Colors Code, Grayscale to RGB conversion	13
V	**Representation and description** - Representation, Boundary descriptors, Regional descriptors, Relational descriptors **Object recognition:** Patterns and pattern classes, Recognition based on decision ,theoretic methods, structural methods	11
	Text Books : 1. Rafael C. Gonzalez, "Digital Image Processing" Addison Wesley	

	Publication 0-201-435772 2. B. Chanda& D. DuttaMajumder, "Digital image processing & analysis" 2nd Edition Eastezn Economy Edition, PHI 2011-978-81-203-43252 3. Anil k. Jain "Fundamental of Digital Image Processing" Eastern Economy Edition, PHI-2010-978-81-203-0929-6	
	References : 1. S. Sridhar "Digital Image Processing" Oxford University press, 2011. 2. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine vision", CL Engineering Publication.	

Course Outcomes:

- Knowledge of the Image enhancement techniques, Image restoration procedures and compression procedures.
- Knowledge of image segmentation and compression techniques.

Course Code	**17MSC212**
Course Name	**Modeling & Simulation**
Course Short Name	**MS**
Total Lectures	**50**
Total Credits	**04**

Prerequisite:

- Knowledge of Calculus, Linear Algebra, Differential Equations, Basic Probability and Statistics.

Course Objective :

- To learn simulation principles and simulation software in brief.
- To study the construction of difference-based computer models.
- To learn methods for reviewing models, their verification and validation.

Units	Contents	Total Lectures
I	**Introduction to Simulation, Simulation Examples, Simulation Principles and Simulation Software:** Introduction, Advantages and Disadvantages of Simulation, Areas of Application, System and System Environment, Components of a System, Model of a Systems, Types of Models, Steps in Simulation Study, Simulation of Queuing systems, Simulation of Inventory systems, General Principles, Concepts of Discrete event Simulation, List processing, History of Simulation Software, Selection and Examples of Simulation, Various Simulation packages, Experimentation and Statistical Analysis Tools.	10
II	**Statistical and Queueing Models in Simulation:** Statistical Models in Simulation, Review of Terminology and concepts, Useful Statistical Models, Discrete Distributions, Continuous Distributions, Poisson Process, Empirical Distributions, Queueing Models, Characteristics of Queueing Systems, Queueing Notations, Long Run Measures of Performance of Queueing System, Steady State Behavior of Infinite Population Markovian Models, Steady State Behavior of Finite Population Models.	12
III	**Random Number and Random Variate Generation:** Properties of Random Numbers, Generation of Pseudo Numbers, Techniques for Generating Random Numbers, Tests for Random Numbers, Random Variate Generation, Inverse Transform Technique, Acceptance- Rejection Techniques, Input Modeling, Data Collection, Identifying the Distribution with Data, Goodness-of-Fit Test, Selecting Input Models without Data, Multivariate and Time Series Input Models.	11
IV	**Verification, Calibration and Validation of Simulation Models:** Model Building, Verification and Validation, Verification of Simulation Models, Calibration and Validation of Models, Estimation of Absolute Performance, Types of Simulation with respect to Output Analysis, Stochastic nature of Output Data, Measure of Performance and their Simulations, Output Analysis for Terminating Simulations, Output Analysis for Steady State Simulation.	12
V	**Estimation of Relative Performance:** Comparison of Two system design, Comparison of Several system design, Meta modeling , Optimization via Simulation**,** Manufacturing and Material Handling Simulations, Goals and Performance Measures, Issues in Manufacturing and Material Handling	11

	Simulations, Case Study of Manufacturing and Material Handling Systems.	
	Text Books: 1. "Discrete Event System Simulation" 5th Edition- Jerry Banks, John S. Carson, Barry L. Nelson & David M. Nicol (PHI). 2. "Simulation Modeling and Analysis"- Averill Law, W. David Kelton (McGrawHill) 3. "System Simulation"- Geffery Gordon (PHI)	
	References: 1. "System Analysis and Modelling" – Donald W. Body (Academic Press Harcourt, India). 2. "Simulation with Arena"- W. David Kelton, Randall Sadowski & Deborah Sadowski (McGrawHill)	

Course Outcomes :

- Ability to derive the mathematical model of the system.
- Knowledge of different system modeling.

Course Code	**17MSC213**
Course Name	**Computer Lab 1(Based on 17MSC210)**
Course Short Name	**CL 1**
Total Teaching Hours	**90**
Total Credits	**6**
Practical list will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC214**
Course Name	**Computer Lab 2(Based on 17MSC211)**
Course Short Name	**CL 2**
Total Teaching Hours	**90**
Total Credits	**6**
Practical list will be freshly prepared by subject teacher in every session. So the list is not mentioned.	

Course Code	**17MSC215**
Course Name	**Project/ Dissertation**
Course Short Name	**Proj**
Total Teaching Hours	**120**
Total Credits	**8**

Prerequisites

- Preliminary knowledge of research methodology.
- Knowledge about technology and application domain in which project will be developed.
- Good knowledge of subject domain and Software Engineering.

Objectives

- To give the students hands on experience of real life system development life cycle involving deadlines and team work.
- To make the students apply the technologies learnt during the programme.
- To provide the experience in analyzing, designing, implementation and evaluating information systems by following proper documentation process.
- To learn research methodology & tools used in research.

Rules for Project Work :

A student will be examined in the course "Project Work" as given below:

1. Project work may be done individually or in groups. However if project is done in groups, each student must be given a responsibility for a distinct task and care should be taken to see the progress of individual.
2. Students should take guidance from a guide and prepare a Project Report on "Project Work" in 2 copies to be submitted to the Head of the Department. A soft copy of project report along with source-code and data should also be submitted.
3. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs, experimental setup and methodology.
4. The project report will be duly accessed by the guide of the project and marks will be communicated by the Head of the Department to the Examination Department.
5. The project report should be prepared in a format prescribed by the College, which also specifies the contents and methods of presentation.

General Instruction Regarding Preparation of Project Report :

TYPING :

(a) The typing shall be standard 12 pts in double spacing using only

(b) Margins must be Left 1.5 inches Right 1 inches Top 1 inches Bottom 1 inches

(c) Paper A4 size Paper

COPIES :

Two hard-bind copies (As per format displayed herewith) One original and one clean Xerox Copy.

FORMAT FOR TITLE PAGE AND FOR COVER PAGE :

PROJECT REPORT

ON

NAME OF THE PROJECT

BY

NAME OF STUDENT

GUIDED BY

NAME OF THE GUIDE

P.G. Department of Computer Science & Technology

Degree College of Physical Eucation

Shree H. V. P. Mandal, Amravati.

ACADEMIC SESSION

Report format for Application Development Projects:	**Report format for Research Projects:**
1 Blank Page at beginning Title Page Certificate from Guide Acknowledgement Index with printed Page Numbers CHAPTER 1 : INTRODUCTION 1.1 Company Profile (optional) 1.2 Existing System and Need for System 1.3 Proposed System 1.4 Scope of Work 1.5 Operating Environment – Hardware and Software CHAPTER 3 : ANALYSIS & DESIGN 3.1 User Requirements 3.2 Software Requirements 3.3 System Flow 3.4 Module Flow 3.5 Module Document 3.6 Input Document 3.7 Computational Method Document (If methods are used) 3.8 Output Document 3.9 Data Flow Diagram (DFD)	1 Blank Page at beginning Title Page Certificate from Guide Acknowledgement Index with printed Page Numbers CHAPTER 1 : INTRODUCTION 1.1 Problem Domain 1.2 Problem Statement 1.3 Experimental Setup CHAPTER 2 : PROBLEM DEFINITION 2.1 Review of Related Work 2.2 Problem Definition CHAPTER 3 : EXPERIMENT DESIGN & METHODOLOGY 3.1 Experiment Design 3.2 Methodology CHAPTER 4: RESULT ANALYSIS a. Data Sheets b. Graphs & Tables c. Sample Code CHAPTER 5: CONCLUSION AND FUTURE SCOPE 5.1 Issues and Limitations 5.2 Conclusion 5.3 Future Scope

Course Outcomes

- Learn proper project documentation.
- Ability to implement the commercial or research project.
- Ability to commissioning of the developed software.
- Presentation and marketing skills for the developed application.