SNDT Women's University

Syllabus

Masters

in

Computer Applications(MCA)

SNDT Women's University

Sir Vithaldas Thackersey Vidyavihar,

Juhu Road, Santacruz West, Mumbai 400 049.

(Applicable to students taking admission in and after 2019)

(Sem I to VI: Modified on 6th July 2019 Ad-hoc BOS)

GENESIS

The SNDT Women's University, the pioneer Women's University in India, was founded on June 2, 1916 by Maharshi Karve with 5 students.

Today, the University has an enrolment of over 50000 students (including those from Junior Colleges) in the formal as well as the non-formal streams, 166 Colleges, 39 University Departments, 4 Faculties and 4 Campuses.

The pioneer Women's University has been in the service of Indian women from all walks of life in a variety of ways for the last nine decades. In its endeavor to give the best in science and technology, as well as to enhance research functions, the University established its computer center in 1985 with the assistance of U.G.C. for an 'O' level and higher level system and has a well-functioning computer center with adequate trained staff. The University was selected by the U.G.C. for conducting the Postgraduate Diploma in Computer Science and Applications (PGDCSA) in 1985 and for conducting the Master of Computer Applications (MCA), now AICTE approved, in 1989 and Master of Science in Computer Science [M. Sc. (CS)] from 2013. These courses follow the prescribed syllabus with a thrust for both theoretical computer science as well as applications.

The response to these courses conducted by the University is overwhelming. Thirty three batches of PGDCSA and twenty nine of MCA students have completed the course and are employed in India and abroad. The alumnae work for some of the best institutions in the world.

The SNDT Women's University is affirmative in its commitment to the empowerment of women through education and pursues excellence unstintingly. The University has obtained an A grade from the National Assessment and Accreditation Council (NAAC).

Vision: *Sanskrita Stree Parashakti*
An Enlightened Woman is a source of Infinite Strength

Mission: Empowerment of Women through Education

OPPORTUNITY

In the rapidly changing area of computer science and technology there is an ever-growing shortage of trained manpower required in educational institutions as well as industry. This problem has been identified as early as 1980 by Rajaraman Committee on Computer Manpower Development and has been reiterated by various panels and study groups set up by the DoE since then. In order to enable one to cope with the ever growing and fast changing technology it is essential for one to acquire appropriate formal training. India has set up priorities, made plans and visualized grand schemes to enter the information technology era, the 21st century. It is clear that this will bring about advances in technology especially in areas such as electronics, space research, biomedical engineering, computer science, communications and genetics.

Computer science is both a pure science as well as an applied science, hence requires a large number of highly qualified personnel. The requirement of personnel can be identified to be in the following sectors viz. manufacturing and maintenance of computer, computer users such as industry and data center, government departments, educational and research organizations, national projects such as that of railways and defense and the growing area of software export.

Computer software development is also a profession particularly suitable for women. As the infra-structural facilities grow, many women will be able to work from their homes, meeting the needs of both the home and the job. This department has so far trained over 755 PGDCSA students and about 946 MCA's who are well placed around the globe. We shall not let any opportunity pass lest they may never come back. The department is proud of its students and its own performance during the last 34 years.

POSTGRADUATE DEPARTMENT OF COMPUTER SCIENCE

The Shreemati Nathibai Damodar Thackersey (SNDT) Women's University Post-Graduate Department of Computer Science offers three courses at the post-graduate level, Master of Computer Applications (MCA – 3 years, full-time), Master of Science (Computer Science) (M.Sc.(CS) – 2 years, full-time) and Post Graduate Diploma in Computer Science and Applications (PGDCSA – 1 year, full time). SNDT admits candidates to MCA based on performance in the state level entrance examination conducted by Directorate of Technical Education (DTE), subject to the eligibility criteria set by DTE. Admission to the PGDCSA course is given by the P.G. Department of Computer Science directly.

1. Objectives

- To provide technical education to women to catalyses their empowerment.
- To fulfill the national need for trained teachers and researchers in Computer Science.
- To promote advanced research, doctoral and postdoctoral work.
- To support the efforts of the University to promote computer awareness and utilization in the various departments.

2. Major Thrust Areas

- Train highly competent computer software professionals needed by the industry.
- Strengthen teaching, research and consulting in the area of computer applications.
- Develop software for the improvement of educational testing and software for students with learning disability.
- Promote teaching materials and manpower for computer science education.
- Participate actively in professional bodies and industry to contribute to the society at large.
- Interact with some of the best in the computing profession to give exposure to students and faculty.
- Establish links with national and international organizations for advanced training and research in computer science.

3. Computing Facility

There are three computer laboratories with best hardware and latest software.

4. Interaction with Industry and Employment

The Department makes consistent efforts to improve the courses to make them relevant. Various industries and Computer organizations are involved in this effort. They do so by functioning on the Department's advisory bodies. The Department gets support from industries for teaching as well. Our past students are employed in some of the finest companies in the world. Some of the students are pursuing higher studies in Computer Science, in India and abroad.

5. Association with Research and Development Organizations

In addition to its linkages with industry the University had signed Memoranda of Understanding with several R&D endeavours with a view to strengthening its academic programmes, and enhancing research facilities of the Department of Computer Science. The co-signatories are:

a. Centre for Development of Advanced Computing (CDAC), formerly NCST, Mumbai.
b. Nuclear Power Corporation of India Limited
c. The Tata Power Company Limited, Andheri, Mumbai
d. Renassaince Mumbai Convention Centre Hotel & Lakeside Chalet- Mumbai, Marriott Executive Apartments.
e. Safe Pvt. Ltd, Andheri(E), Mumbai
f. Selec Controls Pvt. Ltd, Mumbai
g. School of Education and Communication, Jonkoping University, Sweden The department is an institutional member of professional bodies such as Computer Society of India.

6. Research Activities

The Department is actively involved in research in the following areas:

a. Artificial Intelligence (AI)
b. Image Processing
c. Secure Communication
d. Web Technologies
e. Software Engineering and project management
f. Geographical Information System
g. Internet of Things
h. Cyber Security
i. Data Warehousing & Data Mining
j. Machine Learning

7. Self-Enrichment Courses

A series of programmes in the areas of personality development, interview techniques, communication etc. will be arranged.

8. Faculty

The Department has its own full time qualified and experienced faculties for lectures and practical. Several faculty members are actively involved in various areas of research and software development.

9. Visiting Faculty

The University has been receiving the support of research and educational institutions in Mumbai such as IIT (Mumbai), BARC, C-DAC, etc. The Department also receives support from several talented and well-experienced professionals from the Industry as visiting faculty.

10. Library

The University has excellent library facilities having about 2000 volumes of recent editions pure as well as applied computer science. The library subscribes to several leading Indian as well as foreign journals in computer science and related areas. In order to supplement these, the department maintains an appreciable collection of books and journals that are available to the students all the time.

11. Service to other Departments

This department has played a significant role in helping other departments set up computer laboratories; conduct computer related courses and computer awareness programmes.

12. Students and Departmental Activities

The Department makes consistent efforts to improve the quality of the courses it conducts as well as to maintain acceptable standards. In order to develop as well as to assess the individual competence there are regular tests as well as assignments. There is a continuous internal assessment for 50marks. The end of semester examination has a weightage of 50 marks. Group work and collaborative efforts are inculcated by having departmental projects as well as by attaching a group of students to a member of the faculty for discussions, etc. The problem solving capabilities are developed and reinforced by administering aptitude tests, programming assignments and even by organizing various contests. Visits to Computer Centers and Research and Development Organizations with advanced and sophisticated facilities widen the horizon and perspective of students. Experts from Industry, Consultancies and Research Institutes are invited to give lectures on specialized topics. Efforts are made to develop leadership qualities, and other desirable personality traits through extra-curricular activities as well as workshops on personality development, problem solving, etc. Interview techniques and lectures on 'job expectations' prepare them to face the challenges of job seeking. Student participation in the running of the department is achieved by having well-functioning Students Council. There are active student chapters of the Association for Computing Machinery (ACM) and Computer Society of India (CSI). Digital library access is available to the members of the ACM. Students are involved in National Service Scheme (NSS) a community service.

13. Students Council:

Students Council Objectives:

The Students council formally represents the students and endeavors to improve the department. The council shall strive to solve the problems of students being a liaison between the students and the faculty.

Composition:

The student's council is a body composed of

The General Secretary (GS)

Two Assistant General Secretaries (AGS)

Treasurer
Eight Council Members

14. Extra-Curricular Activities

The Juhu Campus of the University has excellent facilities for indoor as well as outdoor activities.

15. Vacation

Students normally get Diwali, Christmas, and summer vacations as per university norms.

Fee Structure:
MCA I year: Rs. 61770/-
MCA II year (Lateral Entry):Rs. 61770/-
Fees are subject to revision.
For Reserved Category fees is as per Govt. norms.

MCA SEMESTER-I

Code	Subject	L	Pr.	Cr.	Int. Exam.	Ext. Exam.	Total Marks
1101	**Operating Systems**	4		4	50	50	100
1102	**Discrete Mathematics**	4	-	4	50	50	100
1103	**Data Structures and Analysis of Algorithm**	4	-	4	50	50	100
1104	**Technical Communications and Soft Skills**	4	-	4	50	50	100
1105	**Data Communications and Networking**	4	-	4	50	50	100
1201	**Operating Systems Lab**	-	2	2	25	25	50
1202	**Data Structures and Algorithm Lab**	-	2	2	25	25	50
	Total			**24**			**600**

MCA SEMESTER-II

Code	Subject	L	Pr.	Cr.	Int. Exam.	Ext. Exam.	Total Marks
2101	**Object Oriented Analysis and Design**	4		4	50	50	100
2102	**Software Architecture**	4	-	4	50	50	100
2103	**Database Management Systems**	4	-	4	50	50	100
2104	**Accounts and Financial Management**	4	-	4	50	50	100
2105	**Statistical Analysis**	4	-	4	50	50	100
2201	**Object Oriented Analysis and Design Lab**	-	2	2	25	25	50
2202	**Database Management Systems Lab**	-	2	2	25	25	50
	Total			**24**			**600**

MCA SEMESTER-III

Code	Subject	L	Pr.	Cr.	Int. Exam.	Ext. Exam.	Total Marks
3101	**Advanced Java**	4		4	50	50	100
3102	**Software Engineering Methodology**	4	-	4	50	50	100
3103	**Computer Network & Programming**	4	-	4	50	50	100
3104	**Research Methodology**	4	-	4	50	50	100
3105	**Cyber Security and law**	4	-	4	50	50	100
3201	**Advanced Java Lab**	-	2	2	25	25	50
3202	**Network Programming Lab**	-	2	2	25	25	50
	Total			**24**			**600**

MCA SEMESTER-IV

Code	Subject	L	Pr.	Cr.	Int. Exam.	Ext. Exam.	Total Marks
4101	**Python Programming**	4		4	50	50	100
4102	**Web Technology**	4	-	4	50	50	100
4103	**Managerial Economics**	4	-	4	50	50	100
4104	**Data Warehousing and Data Mining**	4	-	4	50	50	100
4105	**Elective-I**	4	-	4	50	50	100
4201	**Python programming Lab**	-	2	2	25	25	50
4202	**Web Technology Lab**	-	2	2	25	25	50
	Total			**24**			**600**

MCA SEMESTER-V

Code	Subject	L	Pr.	Cr.	Int. Exam.	Ext. Exam.	Total Marks
5101	**Mobile Application Development**	4		4	50	50	100
5102	**Decision Making and Mathematical Modelling**	4	-	4	50	50	100
5103	**Artificial Intelligence**	4	-	4	50	50	100
5104	**Software Project Management**	4	-	4	50	50	100
5105	**Elective –II**	4	-	4	50	50	100
5201	**Mobile Application Development lab**	-	2	2	25	25	50
5202	**Business Intelligence Lab**	-	2	2	25	25	50
	Total			**24**			**600**

MCA SEMESTER-VI

Code	Subject	L	P/T	Cr	Ext.	Int.	Total
6101	**Seminar***	-	-	8	100	100	200
6102	**Project***	-	-	16	200	200	400
	Total			**24**			**600**

Names of Elective-I
Data Science
Software Testing and Tools
Computer Graphics
Enterprise Resource planning-ERP

Names of Elective-II
Image Processing
Digital Forensics
Geographical information Systems
MULTIMEDIA Applications
Neural network and Fuzzy logic
Design Techniques and data analytics

SEMESTER CREDITS						
I	**II**	**III**	**IV**	**V**	**VI**	**1 Credit (Practical)=2 Hrs** **1Credit(Theory)=1Hr** **1 Credit = 25 marks** **Total Credits=144** **Total Marks=144*25=3600**
24	**24**	**24**	**24**	**24**	**24**	

- **Lab Components are practical oriented and no theory examinations will be conducted. Practical examinations will be conducted and evaluated by Internal and External Examiners.**
- **Int. Exam: C.A.: Internal examination and continuous assessment involves two internal test + Assignments/ Presentation/ Oral/ Viva/Group Discussion etc**

Terms Used:

Pr.: Practical

C.A.: Continuous Assessment

Tw.: Term Work

Cr.: Credits

Int.: Internal

Ext.: External

ASSESSMENT:

(I) The final total assessment of the candidate is made in terms of an internal assessment and an external assessment for each course.

1. For each theory paper, 2credit will be based on internal assessment and 2 credits for end examination (external assessment), whereas the lab papers 1 credit is for internal and one for external.
2. It is mandatory to pass the internal exam of each Subject and hence is eligible for external exams.
3. The division of the 25marks allotted to internal assessment of theory papers is on the basis of Attendance of 5 marks and5 assignment throughout the semester of 5 marks and two written test of 15 marks each taken during the semester (average of two should be taken).
4. The marks of the practical's / lab would be given on external practical exam & oral.
5. No Theory Questions or Exams to be conducted. Only Programs will be asked. Output Questions can be asked.
6. The internal marks will be communicated to the University at the end of each semester. These marks will be considered for the declaration of the results.

(II) Examination:

Examinations shall be conducted at the end of the semester i.e. During December and in May, However supplementary examinations will also be held in December and May.

Students have to pass both the internal assessment and external assessment separately.

Total marks obtained = Internal marks + External marks

MCA DETAILED SYLLABUS

SEMESTER-I

Branch: MCA	Semester-I
Subject Code: 1101	Lecture: 04 Credit: 04
Subject Title	OPERATING SYSTEMS

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage %
UNIT-I	1	**Introduction to Operating Systems (OS):** Computer-System Organization, Computer-System Architecture, Operating- System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems, Special-Purpose Systems, Computing Environments. Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines, Operating-System Generation.	5	10
UNIT-II	2	**Processor Management:** Process concept, Process scheduling, Operations on Processes, Interprocess Communication, Multithreading models, threading issues, Process scheduling algorithms, Thread scheduling, Multiple processor Scheduling. **Process Coordination**: Synchronization, Semaphores, Monitors, Deadlocks characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock detection, recovery from deadlock.	10	20
	3	**Memory Management:** Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation **Virtual memory Management:** Demand Paging, Copy-on-Write, Page replacement, Allocation of Frames, Thrashing.	10	20
UNIT-	4	**File Management:** File Concept, File Access Methods, Directory Structure, File Sharing, File Protection, File-System Structure,	10	20

III		File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, Log-Structured File Systems, NFS. **I/O Management:** I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations, STREAMS, Performance. **Disk Management:** Disk Structure, Disk Attachment, Disk Scheduling, Disk Management , Swap-Space Management, RAID Structure, Stable-Storage Implementation, Tertiary-Storage Structure		
	5	**Distributed systems:** Types of Distributed Operating, Network Structure, Network Topology, Communication Structure, Communication Protocols, Robustness, Design Issues. **Distributed File Systems:** Naming and Transparency, Remote File Access, Stateful Versus Stateless Service, File Replication **Distributed Coordination:** Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock Handling, Election Algorithms, Reaching Agreement	10	20
UNIT-IV	6	**Protection and Security:** Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix , Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection. The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications	10	10

Reference Books:

1. Abraham Silberscatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 7th Ed.John Wiley and Sons, Inc 2005.
2. Milan Milenkovic , Operating Systems Concepts And Design", Second Edition, McGraw-Hill International Editions,"
3. William Stallings, "Operating Systems: Internals and design Principles", 5th Ed Prentice Hall, 2005.
4. Andrew Tanenbaum, "Modern operating systems" 3rd Ed, Pearson Education.

Branch: MCA	Semester-I
Subject Code: 1102	Lecture: 04 Credit: 04
Subject Title	DISCRETE MATHEMATICS

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage %
UNIT-I	1	**Logic and Proofs:** Propositions and logical Operations, Equivalence and Implications Conditional statements; Predicate and quantifiers; Proof Techniques-Mathematical induction, recurrence relations.	8	10
	2	**Relation and Diagraphs:** Relations, Paths and Digraphs, Properties and types of binary relations, closure operation on relations, equivalence relations and partitions, Operations on relations, Transitive closure and Warshall's Algorithm, Lattices.	8	15
UNIT-II	3	**Posets and Lattices:** Introduction, Partial ordered sets**,** Hasse diagram, External elements of partially ordered sets Functions, Lattices, Dual in a lattices, product partial order, special types of lattices	8	20
UNIT-III	4	**Topics in Graph Theory:** Directed and undirected graphs, basic terminology, paths and circuits- Eulerian, Hamiltonian, Transport Network, Planer graphs, Graph coloring.	8	20
	5	**Trees:** definition and properties, rooted trees, tree traversals— preorder, inorder, postorder, Spanning trees and minimum spanning tree.	8	15
UNIT-IV	6	**Algebraic Structures and Applications:** Binary operations, semi-groups and groups, subgroups, cosets, Lagrange's theorem, Product and quotient of algebraic structures, Isomorphism, Homomorphism and Automorphism, cyclic groups, Normal subgroup, codes and group codes, decoding and error correction.	10	20

Reference Books:

1. Bernard **Kolman,** Robert Busby, Sharon C. Ross, "*Discrete Mathematical Structures*", Sixth Edition, 2008, Pearson Education Inc., New Delhi. / Prentice Hall of India (PHI) Pvt. Ltd., New Delhi.
2. Kenneth H. **Rosen, "***Discrete Mathematics and Its Applications*", Sixth Edition, 2008, Tata McGraw-Hill (TMH) Publications Pvt. Ltd., New Delhi.
3. D. S. **Malik** & M. K. Sen, "*Discrete Mathematical Structures*", First Edition, 2005, CENGAGE Learning India Pvt. Ltd., New Delhi.
4. Judith L. **Gersting**, "*Mathematical Structures for Computer Science: A Modern treatment to Discrete Mathematics*", Fifth / Sixth Edition (Asian Student Editions), 2008, W. H. Freeman & Company, New Delhi.

5. Richard **Johnsonbaugh**, "*Discrete Mathematics*", Seventh Edition, 2008, Pearson Education Inc., New Delhi.

Branch: MCA	**Semester-I**
Subject Code: 1103	**Lecture: 04** **Credit: 04**
Subject Title	**DATA STRUCTURES AND ANALYSIS OF ALGORITHM**

Modules	**Sr. No:**	**Topics and Details**	**No. of lectures assigne**	**Marks Weightage**
UNIT-I	1	**Introduction:** Data types , ADT, data structure: Definition & classification Analysis of algorithms (recursive and non-recursive) with emphasis on best case, average case and worst case	4	10
UNIT-II	2	**Linear Data structures with applications:** **List:** Introduction, implementation using array & linked list (singly, doubly, circular, multi-list), Applications: Polynomial representation, Sparse matrix **Stack:** Introduction, implementation using array & linked list, Applications: Function call, Recursion, balancing of parenthesis, Polish Notation: infix to postfix conversion and evaluation of postfix expression **Queue:** Introduction (queue, circular queue, deque, priority queue), implementation using array & linked list, Applications: Job SchedulingF	12	25
UNIT-III	3	**Non Linear data structures:** **Tree:** Introduction and representation, Forest, Tree traversal, Binary Tree (representation using array and links): Binary tree traversal (recursive & non-recursive implementation), Expression tree **Graph:** Introduction, representations, Traversal(BFS, DFS), Applications: Shortest path (Single source-all destinations), Minimal spanning tree (Prim's algorithm, Kruskal's algorithm)	12	25

UNIT-IV	4	**Searching and Sorting:** Linear Search, Binary Search, Transpose sequential search, Binary search tree, Heap tree (application in priority queue and sorting), AVL tree, Splay tree, M-way search tree, B tree (insertion), B+ tree (Definition and introduction), B* tree (Definition and introduction), Tries, Application of B tree and B+ tree in File Structures **Hash Tables:** Introduction, hash functions and hash keys, Collisions, Resolving collisions, Rehashing **Sorting with algorithm analysis** (best case, worst case, average): Bubble, Selection, Insertion, Shell, Merge, Quick, Heap, Radix	14	30
	5	**NP-Completeness and the P & NP Classes** Introduction, Polynomial T i m e & Verification, N P - Completeness and Reducibility, The Vertex Cover Problem, The Traveling Salesman Problem, The Set Covering Problem	8	10

Reference Books:

1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd edition (2003)

2 G. A.V. PAI, "Data structures and algorithms, concepts, Techniques and Applications", 1st edition (2008)

3 Horowitz, Sahni, Anderson-Freed, "Fundamentals of Data Structures in C", University Press (2nd edition-2007)

4 Jean-Paul Tremblay, Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, 2 Edition, (2007)

5 Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithm", PHI (2003),2nd Edition

6 Gilberg & Forouzan, "Data Structures: A Pseudo-code Approach with C", Thomson Learning

7 Parag Dave & Himanshu . Dave, "Design and Analysis of Algorithms", Pearson Education (2008)

8 Tanenbaum, "Data Structures Using C & C++", PHI.

9 Michel Goodrich, Roberto Tamassia, "Algorithm design-foundation, analysis &internet examples", Wiley

10 A V Aho, J E Hopcroft, J D Ullman, "Data Structures & Algorithms", Addison-Wesley Publishing (1983).

11 Michael Berman, "Data Structures Via C++: Objects by Evolution", Oxford Univ.Press (2004)

12 D E Knuth, "Sorting & Searching - The Art of Computer Programming",Vol. 3, Addison- Wesley Publishing (1973).

Branch: MCA	Semester-I
Subject Code: 1104	Lecture: 04 Credit: 04
Subject Title	TECHNICAL COMMUNICATIONS AND SOFT SKILLS

Modules	Sr. No.	Topic and Detail	No. of Lectures assigned	Marks Weightage %
UNIT-I	1	Technical communication , Fundamentals of technical communication, Oral and written communication, Preparing oral presentations and supporting materials, Standards of communication	8	15
UNIT-II	2	Written communication, Essays, Technical leaflets, Term papers, Research Papers ,White paper and technical summaries, Project proposals, Tenders, Contracts and quotations, Technical specifications, Monographs ,Dissertations and Thesis, Software project documentation of all kinds	8	20
	3	Self-Development and Assessment Self-Assessment, Self-Awareness, Perception and Attitudes, Values and Belief System, Personal Goal Setting, Career Planning, Self-Esteem, Building of Self-Confidence	8	15
UNIT-III	4	Ethics and Etiquettes Business Ethics, Etiquettes in social as well as Office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics and ethics as an IT professional, Civic Sense. Time Management Managing time, Meditation, Understanding roles of Engineer and their Responsibility, Culture in today's job Places.	10	15
UNIT-IV	5	Group Discussion Understanding the nature of discussion, Difference between debate and discussion, Ways to form and present the arguments, Ways to defend. Personal Interviews & Public Speaking To learn the skills of appearing in an interview. To get acquainted with the art of public speaking, the art of effective or persuasive speaking.	10	20
	6	Improving Personal Memory, Study skills that include Rapid reading, Complex problem solving, and creativity.	6	15

Reference Books:

1. "Technical Communication", Minakshi Raman & Sharma
2. "Writing and Speaking in the Technology Professions": A Practical Guide, David F. Beer,

3. "Business Communication": Raymond V, Leiskar John D, Pettit J. V.
4. "Communications": Dr. C. S. Rayuder, Himalaya Publication.
5. "Communication Skills for Effective Management": Dr. Anjali Gnekar, Everest Publishing House.
6. "Powerful Presentation Skills": Career Press, USA.

Branch: MCA	**Semester-I**
Subject Code: 1105	**Lecture: 04** **Credit: 04**
Subject Title	**DATA COMMUNICATIONS AND NETWORKING**

Modules	**Sr. No.**	**Topic and Details**	**No of Lectures Assigned**	**Marks Weightage %**
UNIT-I	1	**Introduction:** Computer Networks and its uses, Network categorization and Hardware : Broadcast and point-to-point networks, Local Area Network (LAN), Metropolitan Area Network (MAN), Wide Area Networks (WAN), Inter networks, Topologies, Wireless Networks, Network Software : Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Comparison of OSI and TCP/IP Models. Introduction to Example Networks: Internet, Connection-Oriented Networks – X.25, Frame Relay, ATM	6	15
	2	**Data Communication Model**, Digital and Analog data and signals, bit rate, baud, bandwidth, Nyquist bit rate, Guided Transmission Media – Twisted Pair, Coaxial cable, Optical fiber; wireless transmission – Radio waves, microwaves, infrared waves; Satellite communication.	4	10
UNIT-II	3	**Switching :** Circuit Switching, Packet switching; Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Synchronous and Asynchronous TDM, Modems, Transmission impairments, Manchester and differential Manchester encoding.	6	15
	4	**Error Detection and Correction:**Types of errors Redundancy, Detection Versus Correction, Error Detection, Error Correction, Hamming Code, Cyclic Redundancy Check, Checksum and Its idea.	8	15
UNIT-III	5	**Data Link Layer Design issues:** Framing, error control, Flow Control, Error Detection and correction; Elementary Data Link Protocols, Sliding Windows Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols, Limited Contention	14	25

		Protocols; Wavelength division Multiple access protocol, Wireless LAN Protocol: MACA; IEEE 802.3 Ethernet, IEEE 802.4 Token Bus; IEEE 802.5 Token ring, Binary Exponential Backoff algorithm, Digital Cellular, Radio : Global System for Mobile Communication (GSM), Code Division Multiple Access(CDMA)		
UNIT-IV	6	**Network Layer, Design issues**, Virtual circuit and Datagram Subnet, Routing Algorithms, Optimality principle, Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast and Multi Cast Routing, Routing for Mobile hosts, Routing in Adhoc Networks, congestion Control Algorithm, General Principals Traffic Shaping, Leaky Bucket, Token Bucket, choke packets, Load Shedding	12	20

Reference Books:

1. Behrouz A. Forouzan. Data Communications and Networking (4th Edition). McGraw Hill. ©2007. ISBN: 0-07-296775-7.
2. Data and Computer Communications, 10th ed., by William Stallings, Pearson
3. Computer Networks, Andrew S. Tanenbaum 5th edition.

Branch: MCA	**Semester-I**
Subject Code: 1201	**Practical: 02** **Credit: 02**
Subject Title	**OPERATING SYSTEMS LAB**

Modules	**Sr. No:**	**Topics and Details**	**No: of lectures assigned**	**Marks Weightage %**
UNIT-I	1	Installation of OS on Virtual Machine (VM, OracleBOX etc) **File Commands:** ls, cp, mv, rm, ln, cd, mkdir, rmdir, chown, chgrp, chmod, gzip, tar, updated, find. **Commands to Access File Contents:** cat, less, diff **File Systems: Mount, umount** **System Commands:**System Information:df, du , free, date	2	5
	2	**Processes:** top, ps, kill, killall **Network:** ping, nslookup, telnet Other: IOSTAT, SAR, Pstat, Netstat command and its parameters.	3	
UNIT-II	3	**The grep Family:** The grep Command, grep Examples with Regular Expressions, grep with Pipes, grep with Options, egrep (Extended grep), Fixed grep or Fast grep	5	20

UNIT-III	4	**Introduction to UNIX Shells:** Definition and Function, System Startup and the Login Shell, Processes and the Shell, The Environment and Inheritance, Executing Commands from Scripts. The Interactive Bourne Shell, The C Shell, The Korn Shell, The Interactive bash Shell Regular Expressions, Combining Regular Expression Metacharacters	5	5
UNIT-IV	5	**Programming with the bash Shell:** Introduction Section, Reading User Input, Arithmetic, Positional Parameters and Command Line Arguments, Conditional Constructs and Flow Control Section, Looping Commands, Functions Section , Trapping Signals, Debugging, Processing Command Line Options with getopts, The eval Command and Parsing the Command Line, bash Options, Shell Built−In Commands.	10	20

Reference Book:

1. "Unix Shell by Examples" 4th Edition, Ellie Quigley, Pearson Edition
2. "Introduction to Unix and Shell Programming", Pearson Education, M.G. Venkatesh murthy
3. Advanced Linux Programming, Mark Mitchell, Jeffrey Oldham, and Alex Samuel, New Riders Publishing
4. Unix/Linux Programming by Sumitabha Dass, PHP

Branch: MCA	**Semester-I**
Subject Code: 1202	**Practical: 02** **Credit: 02**
Subject Title	**DATA STRUCTURES AND ALGORITHM LAB**

Modules	**Sr. No:**	**Topics and Details**	**No. of lectures assigned**	**Marks Weightage**
UNIT-I	1	Implementation of linear data structure Array.	3	06
	2	Implementation of Searching and Sorting Algorithms	4	
UNIT-II	3	Implementation of linear data structure Linked List.	4	20
UNIT-III	4	Implementation of stack, queue, enqueue, dequeue.	4	
UNIT-IV	5	Implementation of Tree data structure.	6	24
	6	Graph: DFS, BFS.	4	

SEMESTER II

Branch: MCA	Semester-II
Subject Code: 2101	Lecture: 04 Credit: 04
Subject Title	OBJECT ORIENTED ANALYSIS AND DESIGN

Modules	Sr. No:	Topics and Details	No: of lectures assigned	Marks Weightage %
UNIT I	1	**Overview of Object Oriented Systems Development:** Two Orthogonal Views of the Software, Concept of Object Oriented Software, Importance of Object Oriented Software, Object Oriented Future, Object Oriented Systems Development Methodology, Overview of Unified Approach. **Object Basics:** An Object Oriented Philosophy, Objects, Object Behavior, Object Oriented Properties, Association and Aggregation.	10	20
UNIT II	2	**Object Oriented Systems Development Life Cycle:** The Process of Software Development, Developing Good Quality Software, Use Case Driven Approach for Object Oriented Systems Development, Reusability. **Object Oriented Methodologies:** Introduction, Types of Object Oriented, Methodologies, Patterns, Unified Approach. Comparing methodologies using structure analysis and design, Jackson's structured development Information modeling notation and object oriented works	10	20
UNIT III	3	**Unified Modeling Languages (UML):** Overview of Unified Modeling Language (UML), Static and Dynamic Models, UML Diagrams, UML Class Diagrams, Use-Case Diagrams, UML Dynamic Modeling, Implementation diagrams, Model Management: Package and Model Organization, UML Extensibility, UML Meta-Model. **Behavioral Modeling using UML:** Interactions, Use cases, Use case diagram, Interaction Diagrams and Activity diagrams, Events and signals, State Machines, Processes and Threads, Time and space,	10	20

		State chart diagrams		
UNIT IV	**4**	**Object Oriented Analysis – Identifying Use-Cases:** Complexity in Object Oriented Analysis, Business Process Modeling and Business Object Analysis, Use-Case Driven Object Oriented Analysis, Use-Case Model, Developing Efficient Documentation. **Object Analysis: Classification:** Object Analysis, Classification Theory, Approaches for Identifying Classes, Class Responsibility Collaboration. **Object Oriented Analysis – Identifying Relationships, Attributes, and Methods:** Introduction, Associations, Inheritance Relationships, A Part of Relationship-Aggregation, Class Responsibility: Identifying Attributes and Methods, Class Responsibility: Defining Attributes, Object Responsibility: Methods and Messages.	**10**	**20**
	5	**Object Oriented Analysis and design Methodology with examples** Shlaer/ Mellor, Coad/ Yourdaon and Nocolas's, Rambaugh – OMT, Martin/Odell Methodologies	**10**	**20**

REFERENCE BOOKS:

1. Object Oriented Modeling and Design: Rambaugh, Premerlani, Eddy, Lorenson (PHI)
2. The Unified Modeling Language User Guide, Grady Booch, Jeams Rambaugh, Ivar Jacotson (Addison Wesley)
3. Object Oriented Analysis and Design – Grady Booch
4. Object Oriented Analysis and Design – Andrew High (TMG)
5. Practical Object Oriented Design with UML – Mark Priestley.
6. Object oriented Analysis & design – Kahate (TMH)
7. Martin Fowler, ―UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third edition, Addison Wesley, 2003.

Branch: MCA	Semester-II
Subject Code: 2102	Lecture: 04 Credit: 04
Subject Title	SOFTWARE ARCHITECTURE

Modules	Sr. No:	Topics and Details	No: of lectures assigned	Marks Weightage %
UNIT I	1	**Basic Concepts** • Concepts of Software Architecture • Models. • Processes. • Stakeholders.	03	5
	2	**1 Designing Architectures** • The Design Process. • Architectural Conception. • Refined Experience in Action: Styles and Architectural Patterns. • Architectural Conception in Absence of Experience.	02	5
UNIT II	3	**Connectors** • Connectors in Action: A Motivating Example. • Connector Foundations. • Connector Roles. • Connector Types and Their Variation Dimensions. • Example Connectors.	06	15
	4	**Modeling** • Modeling Concepts. • Ambiguity, Accuracy, and Precision. • Complex Modeling: Mixed Content and Multiple Views. • Evaluating Modeling Techniques. • Specific Modeling Techniques.	04	10
	5	**Analysis** • Analysis Goals. • Scope of Analysis. • Architectural Concern being Analyzed. • Level of Formality of Architectural Models. • Type of Analysis. • Analysis Techniques.	08	20
	6	**Implementation and Deployment** • Concepts. • Existing Frameworks. • Software Architecture and Deployment. • Software Architecture and Mobility.	04	5

UNIT III	**7**	**Conventional Architectural styles** • Pipes and Filters • Event- based, Implicit Invocation • Layered systems • Repositories • Interpreters • Process control	**05**	**10**
	8	**Applied Architectures and Styles** • Distributed and Networked Architectures. • Architectures for Network-Based Applications. • Decentralized Architectures. • Service-Oriented Architectures and Web Services.	**08**	**15**
UNIT IV	**9**	**Designing for Non-Functional Properties** • Efficiency. • Complexity. • Scalability and Heterogeneity. • Adaptability. • Dependability.	**05**	**10**
	10	**Domain-Specific Software Engineering** • Domain-Specific Software Engineering in a Nutshell. • Domain-Specific Software Architecture. • DSSAs, Product Lines, and Architectural Styles.	**05**	**5**

REFERENCE BOOKS:

1. "Software Architecture: Foundations, Theory, and Practice" by Richard N. Taylor, Nenad Medvidovic, Eric Dashofy, ISBN: 978-0-470-16774-8
2. M. Shaw: Software Architecture Perspectives on an Emerging Discipline, Prentice-Hall.
3. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, Pearson.
4. "Pattern Oriented Software Architecture" by Frank Buchnan et al, Wiley India.
5. "The Art of Software Architecture" by Stephen T. Albin

Branch: MCA	**Semester-II**
Subject Code: 2103	**Lecture: 04** **Credit: 04**
Subject Title	**DATABASE MANAGEMENT SYSTEMS**

Modules	**Sr. No.**	**Topic and Detail**	**No. of Lectures assigned**	**Marks Weight age %**
UNIT-I	1	**Introduction :** Database System Applications ,Database Systems versus File Systems, View of Data, Data Models, Database Languages, Database Users and Administrators, DBA Roles and activity, Database System Structure	2	20

	2	**Entity –Relational Model :** Basic Concepts, Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features, Design of E-R Database Schema, Reduction of an E-R Schema to Tables.	2	
	3	**Relational Model :** Structure of Relational Databases, Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus	4	
UNIT-II	4	**SQL :** SQL commands, Functions, Data Constraints, Grouping Data, Subqueries, Joins, Performance Tuning, Security Management, PL/SQL, Triggers.	8	15
	5	**Integrity & Security :** Domain Constraints, Referential Integrity, Assertions, Triggers, Privileges in SQL.	4	
	6	**Relational Database Design :** Functional Dependencies, Decomposition, Normalization – 1NF – 5NF , BCNF	4	
UNIT-III	7	**Storage & File Structure :** RAID , Improvement of Reliability & Performance Indexing & Hashing – Basic Concepts, Ordered Indices, B+ & B Tree Index Files, Static & Dynamic Hashing , Comparison of Ordered Indexing & Hashing.	8	15
	8	**Transactions:** Transaction Concept & State, Implementation of Atomicity & Durability, Serializability, Recoverability, Testing for Serializability.	4	20
UNIT-IV	9	**Concurrency Control:** Protocols- Lock Based, Timestamp-based, Validation Based, Deadlock Handling & Concurrency	4	15
	10	**Recovery System :** Failure Classification, Storage Structure, Recovery & Atomicity, Log based Recovery, Shadow Paging, Recovery with Concurrent Transactions, Buffer management, failure with loss of nonvolatile storage, advanced recovery techniques.	4	
	11	**Object – Oriented Databases :** New Database Applications, Object – Oriented Data Model, Object-Oriented Languages, Persistent Programming Languages, Persistent C++ Systems	4	10
	12	**Introduction, Overview of NoSQL Databases** –Four Types of NoSQL (Document-oriented, KeyValue Pairs, Column-oriented and Graph).	2	5

Reference Books:

1. Database System Concepts : Henry Korth, Silberschatz, Sudarshan 5th Edition, McGraw-Hill
2. Fundamentals of Database Systems: Elmasri&Navathe 3rd Edition , Pearson Education India, 01-Sep-2008 - 1168 pages
3. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke; McGraw-Hill International Edition, 2002 edition

4. Modern Database Management (Seventh Edition); Jeffrey A. Hoffer, Mary Prescott, Fred McFadden; Prentice Hall, 2004
5. Database systems: Design, Implementation and Management; Peter Rob, Carlos Coronel; Thomson Publication, 2004
6. Database Processing: Fundamentals, Design, Implementation (tenth Edition); D. M. Kroenke; Prentice-Hall, 2005
7. Data Base Principles Programming Performance (Second Edition); Patrick O.Neil; Morgan Kaufmann Publishers, Inc., 2000
8. Oracle 8i PL/SQL Programming : Scott Urman

Branch: MCA	**Semester-II**
Subject Code: 2104	**Lecture: 04** **Credit: 04**
Subject Title	**ACCOUNTS AND FINANCIAL MANAGEMENT**

Modules	**Sr. No:**	**Topics and Details**	**No. of lectures assigned**	**Marks Weightage**
UNIT-I	1	Principles of accounting, Nature and scope of accounting and financial management, Double-Entry system of accounting ,Introduction to basic books of accounts of sole proprietary concern, Closing of books of accounts.	4	8
	2	Preparation of trial balance, Final Accounts, Trading, profit and loss accounts, Balance Sheets of sole proprietary concern with normal closing entries, Introduction to manufacturing accounts, Final accounts of partnership firms and Limited companies, GST, Control accounts for debtors and creditors, Ratio Analysis, Meaning, advantages, Limitations, Types of ratios and their usefulness, Fund flow statement, Meaning of the term fund: Flow of fund.	12	24
UNIT-II	3	Working capital cycle, Preparation and interpretation of statement, Costing, Nature, importance and basic principles, Budget and budgetary control, Nature, scope and Importance, Method of finalization of master budget Functional budget.	12	24
UNIT-III	4	Marginal costing, Nature, scope and Importance, Construction of break-even chart, Limitations and uses of break-even chart, Practical applications of marginal costing, Standard Costing, Nature and scope of standard cost	12	24
UNIT-IV	5	Variance, Variance analysis with reference to material, labour, Overhead costs, Interpretation of the variance	10	20

Reference Books:

1. "Accounting &Book-Keeping": Kishnadwala
2. "Book-Keeping &Accountancy": Choudhari,Chopade.

Branch: MCA	**Semester-II**
Subject Code: 2105	**Lecture: 04** **Credit: 04**
Subject Title	**STATISTICAL ANALYSIS**

Modules	**Sr. No:**	**Topics and Details**	**No. of lectures assigned**	**Marks Weightage**
UNIT-I	1	Introduction to data: Types of variables; data collection principles; types of studies. Graphical methods: histograms and other graphs Frequency distribution, measures of central tendency, measures of dispersion, Linear correlation and Regression, Time series, Forecasting: moving average and exponential	10	20
UNIT-II	2	Elementary probability theory, Conditional probability, Bayes theorem, Random variable Expected values, Discrete Probability distributions: Uniform, Binomial, Poisson, Hyper-geometric, Empirical distribution Continuous distributions: Uniform, Exponential, Normal, Relationship between Poisson and exponential distribution	10	20
UNIT-III	3	General discussion on sampling errors, sampling bias. Sampling: Random, Stratified Random, Cluster, and Systematic Interval estimation (mainly two sided) of the mean (using normal and t distributions), estimation for the proportions (normal approximation). Elements of Hypothesis Testing : Null and Alternative hypotheses, Simple and Composite hypotheses, Critical Region, Type I and Type II Errors, Level of Significance.	10	20
UNIT-IV	4	Hypothesis Testing: Single parameter (μ , σ^2 and p) – z, t, χ^2 tests, normal approximation for p. Two parameters (means and variances): z, t, paired t, F. Mention comparison of two proportions with normal approximation. Calculate and interpret p value.	10	20
UNIT-V	5	$\chi 2$ –statistic and its uses, $\chi 2$ test of goodness of fit. $\chi 2$ test for independence.. Yate's correction in a 2 x 2 contingency table. Use of some relevant statistical packages.	10	20

Reference Books:

1. Business Statistics in Practice", Bruce, 8th ed., McGraw-Hill Higher Education, ISBN 978-1-259-54946-5, MHID 1-259-54946-1. Authors:
2. "Applied statistics and probability for engineers', Montgomery, Douglas C. and George C. Runger, John Wiley & Sons, 2010
3. "Statistics and Data Analysis: From Elementary to Intermediate", Tamhane, A. C. and Dunlop, D. D. (2000). Prentice Hall: Upper Saddle River, NJ. ISBN: 0-1374-4426-5
4. "Probability and Statistics for Engineers and Scientists", Hayter, A. J. (2012), 4th edition, ISBN: 1111827044.
5. "Introductory Statistics with R",Dalgaard, P. (2008). Springer Science and Business Media. ISBN: 978-0-387-79053-4.

Branch: MCA	**Semester-II**
Subject Code: 2201	**Practical: 02** **Credit: 02**
Subject Title	**OBJECT ORIENTED ANALYSIS AND DESIGN LAB**

Modules	**Sr. No:**	**Topics and Details**	**No.of Lectures/ Practicals**	**Marks Weightage**
UNIT-I	1	Project Description	1	02
	2	Project Statement	1	02
UNIT-II	3	Identify Use Cases and develop the Use Case model	2	
	4	Identify the business activities and develop an UML Activity diagram.	2	16
UNIT-III	5	Identity the conceptual classes and develop a domain model with UML Class diagram.	2	
	6	Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation	8	30
UNIT-IV	7	develop a mini-project following the exercises listed above	14	

Branch: MCA	**Semester-II**
Subject Code:2202	**Practical: 02** **Credit: 02**
Subject Title	**DATABASE MANAGEMENT SYSTEMS LAB**

Modules	**Sr. No:**	**Topics and Details**	**No: of lectures**	**Marks Weight**

			assigned	age %
UNIT-I	1	Database, Table Creation	2	05
	2	Defining Schema, Constraints, Normalisation	3	15
UNIT-II	3	SQL Basic Queries	2	
	4	Joining, and Clauses implementation	2	10
UNIT-III	5	Procedure, Function execution	4	
	6	PL SQL Script Execution	4	20
UNIT-IV	7	Stored Procedure , Function, Packages Execution	4	
	8	Cursor, Trigger Writing , Cost optimization for query tuning	4	

References: 1. Oracle 8i The Complete Reference: Loney, Koch

SEMESTER III

Branch: MCA	**Semester-III**
Subject Code: 3101	**Lecture: 04** **Credit: 04**
Subject Title	**ADVANCED JAVA**

Modules	**Sr. No.**	**Topic and Details**	**No. of lectures assigned**	**Marks Weightage**

UNIT-I	1	**Introduction:** History, architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection. Object Oriented Programming, packages, enumerations, Multi threading, Exception Handling. **Abstract Window Toolkit:** Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames, JAVA adapter classes. **Layouts:** Flow Layout, Grid Layout, Border Layout, Card Layout.	6	12
	2	Introduction to Event Handling – Identifying the source of Event, Event Listeners and Event Handlers, the Delegation Event Model, Event classes, Event Listener Interface, Action Listener interface, MouseListener Interface Adapter classes- the Mouse Adapter class, the MouseMotion Listener Interface.	10	20
UNIT-II	3	Introduction to JDBC – What is JDBC. Database connectivity , JDBC Architecture, JDBC drivers, Using JDBC API – Loading a Driver, connecting and executing JDBC statement, Handling SQL Exceptions. Accessing Result Sets, method of Result Set interface, Methods of PreparedStatement interface , retreving row, inserting row, Managing Database Transactions, creating and calling stored procedures in JDBC, using Metadata in JDBC.JAVA Stream in JDBC, Stubs and drivers, Introduction to creation and deployment Jar, WAR , ear	12	24
UNIT-III	4	Introduction to Spring Framework, Spring Architecture, Spring Aspect of Object Oriented Concepts – Join Point and Point Cuts. Spring web applications with Spring MVC. Features of the Spring Boot. Use of Spring Boot to create and configure a Spring application. Customize Spring Boot features. REST web services with Spring. Spring DataSecure with Spring Security. JMS-Introduction , requirement, JMS Programming model. JMS support of Spring.	12	24

UNIT-IV	5	**Introduction to servlets** Servlet vs CGI, Servelet API overview, Servlet Life cycle, Generic servlet, HTTPServlet, ServletConfig, ServletContext, Handling HTTP Request and response – GET / POST method, request dispatching, Using cookies, Session tracking.Web development using JSP Introduction to JSP, JSP Architecture, JSP Directives, JSP scripting elements, Default objects in JSP, JSP Actions, JSP with beans and JSP with Database, Error handling in JSP, tracking techniques in JSP, Introduction to custom tags, JSTL tags in detail. Introduction to jQuery, JS, JS JSON, jQuery vs JS RMI – Overview of distributed Application , Remote Method Invocation, components of RMI application , RMI architecture, RMI Packages, Distributed Garbage collection, Remote interface, creating RMI server, creating RMI client, client side cabecks.	10	20

Reference Books:

1. 1. Java™ 2: The Complete Reference, Third Edition, by Patrick Naughton and Herbert Schildt, Tata McGraw Hill Edition 1999.
2. Java Enterprise in a Nutshell: A Desktop Quick Reference (Nutshell Handbook) or any other book with similar contents.
3. Mastering Java2 J2SE1.4 by John Zukouski PBP Publication
4. JavaTM How to Program Sixth Edition by H.M Deitel, P.J. Deitel
5. Core Servlets & JavaServer Pages by Marty Hall, Larry Brown
6. Spring Boot in Action 1st Edition by Craig Walls

Branch: MCA	**Semester-III**
Subject Code: 3102	**Lecture: 04** **Credit: 04**
Subject Title	**SOFTWARE ENGENEERING METHODOLOGY**

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage
UNIT-I	1	Software Processes: Processes projects and products, Component software processes, characteristics of a software process, software Development Process, project management process, software configuration management process, software configuration management process, process management process.	8	16
	2	Software requirement Analysis and Specification: Software requirement, need for SRS, requirement process, problem analysis, analysis issues. Informal approach, structured analysis, object oriented modeling, other modeling approaches, prototyping, requirement specification, characteristics of an SRS, component of an SRS, specification languages, structure of requirement document validation requirement reviews, other method metrics, size measures, quality metrics.	8	16
UNIT-II	3	Planning Software Project:- Cost estimation, uncertainties in cost estimation, building cost estimation models, on size estimation, COCOMO model, project scheduling, average duration estimation, project scheduling and milestones, staffing and personnel planning, rayleigh curve, personnel plan, team structure, software configuration management plans, quality assurance plans, verification and validation, project monitoring plans, risk management.	8	16
	4	Function Oriented Design:- Design principles, coupling, cohesion, design notation and specification, structured design methodology, verification, network metrics, stability metrics, information flow metrics Software Testing.	4	08
UNIT-III	5	Testing Methods : Software testing fundamentals, test case design, white box testing, control structure testing, black-box testing, testing for specialized environments. Software Testing Strategies: A Strategic Approach to software testing, strategic issues, unit testing, validation testing, system testing, the art of debugging.	8	16
UNIT-IV	6	Re-Engineering : Software re-engineering, software maintenance, a software reengineering process model, reverse engineering, reverse engineering user interfaces, restructuring, code restructuring, data restructuring, forward engineering the economics of reengineering.	6	12
	7	Client/Server software Engineering: The structure of client/server systems, software engineering for c/s systems, analysis modeling issues, design for C/S systems, testing issues. Computer-Aided Software Engineering: What is case, building blocks for case, a taxonomy of case tools, integrated case environments, the integration architecture, the case repository. MPP architecture	8	16

Reference Books:

1. Presman Roger, Software, Engineering: A Practitioner's Approach Tata McGraw Hill, New Delhi.
2. Jalote Pankaj, An Integrated Approach to Software Engineering Narosa, New Delhi
3. R.E. Fairly. Software Engineering Concepts. McGraw Hill, Inc 1985.
4. Poyce, Software Project Management, Addison-Wesly.
5. Sommerville , Software Engineering, Addison-Wesly.

Branch: MCA	**Semester-III**
Subject Code: 3103	**Lecture: 04** **Credit: 04**
Subject Title	**COMPUTER NETWORK & PROGRAMMING**

Modules	**Sr. No:**	**Topics and Details**	**No: of lectures assigned**	**Marks Weightage**
UNIT-I	1	**Introduction to Networking** Introduction to computer network, network application, network software and hardware components (Interconnection networking devices), Network topology, protocol hierarchies, design issues for the layers, connection oriented and connectionless services. Reference models: Layer details of OSI, TCP/IP models. Communication between layer. **Network Hardware** Network Introduction, Network Interface Adapter-Function, Features, Selection of NIC. Cabling a Network – Cable properties, Standards, Types, cable installation. Network Interconnection devices: Repeaters, Hubs, Bridges, Routers, Switches, Server Technologies: Multiple processor server, Server storage technologies. Designing a Network.	5	10
	2	**Network Operating System:** a) Windows 2000 and Windows NT Overview, Windows Networking Architecture, File System, Windows Networking Services. Windows NT Domains. b) Novell Netware: Netware role in Enterprise, Netware Versions, Netware installation, Netware Storage Subsystem. c) Linux d) Network Clients: Windows Network Clients, Netware Clients, Unix	5	5

UNIT-II	3	**Directory Services:** a) Active directory services Active directory architecture, Deploying active directory, designing active directory, Managing, Active directory. b) Novel directory services : NDS architecture, NDS tree design, Building the tree NDS security.	5	15
	4	**Installation of NOS** a) Installation of windows 2000 / windows NT b) Installation of Novell etware c) Installation of Linux	5	10
UNIT-III	5	**Managing users and groups** Managing users and groups on windows, Linux and NetWare. Configuration of Network and communication services a) DHCP b) DNS c) WINES **File system** a) NTFS and distributed file system on win 2000 b) NFS c) Sharing and securing files and folders	5	10
	6	**Network Services** a) Web serve b) Ftp Server c) E-mail erver d) Telnet Server	7	15
	7	**Network Management and troubleshooting tools** a) Operating System utilities b) TCP/IP utilities, c) Network analyzer d) Traffic analysis e) Protocol analysis f) Network Management Using SNMP.	8	15
UNIT-IV	8	**Network programming** UNIX Networking architecture, Sockets API in UNIX Preliminary system calls for TCP/UDP sockets, I/O models in UNIX, Socket Options, and Advance I/O system calls. Broadcasting and Multicasting, Raw Sockets and Data-link access, Remote Procedure Calls, Basic architecture for RPC, RPC runtime library – high level and low level calls. XDR (eXtended Data Representation) format and XDR filters.	10	20

Reference Books:

1. The complete Reference Networking by Craig Zacker TMH Publication.
2. Distributed Systems and Networks by William Buchanan TMH Publication.
3. Windows 2000 Server Bible by Jeffrey R.S shapiro and Jim Boyee IDG Books India.
4. Unix Administration Handbook Evi Nemeth, Garth Snyder Pearson Education
5. The complete reference Linux by Richard L. Peterson Tata Mcgraw Hill Publication

6. Introduction to Computer Networks - Andrew S. Tanenbaum
7. UNIX Network Programming, Volume I and II - W. Richard Stevens
8. Power Programming with RPC - John Bloomer
9. RPC handbook, Java Programming Language - Ken Arnold, James Gosling
10. JDK 1.2 Documentation
11. Network Security Essentials – William Stallings

Branch: MCA	**Semester-III**
Subject Code: 3104	**Lecture: 04** **Credit: 04**
Subject Title	**RESEARCH METHODOLOGY**

Modules	**Sr. No.**	**Topic and Details**	**No of Lectures Assigned**	**Marks Weightage**
UNIT-I	1	Research methodology: An Introduction Objectives of Research, Types of Research, Research Methods and Methodology, Defining a Research Problem, Techniques involved in Defining a Problem.	4	08
	2	Research Design Need for Research Design, Features of Good Design, Different Research Designs, Basic Principles of Experimental Designs, Sampling Design, Steps in Sampling Design, Types of Sampling Design, Sampling Fundamentals, Estimation, Sample size Determination, Random sampling.	6	12
UNIT-II	3	Measurement and Scaling Techniques Measurement in Research, Measurement Scales, Sources in Error, Techniques of Developing Measurement Tools, Scaling, Meaning of Scale, Scale Construction Techniques.	10	20
	4	Methods of Data Collection and Analysis Collection of Primary and Secondary Data, Selection of appropriate method Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measures o f skewness, Regression Analysis, Correlation.	8	18
UNIT-III	5	Techniques of Hypotheses, Parametric or Standard Tests Basic concepts, Tests for Hypotheses I and II, Important parameters limitations of the tests of Hypotheses, Chi-square Test, Comparing Variance, As a non-parametric Test, Conversion of Chi to Phi, Caution in using Chi-square test.	12	24
UNIT-IV	6	Analysis of Variance and Co-variance ANOVA, One way ANOVA, Two Way ANOVA, ANOCOVA Assumptions in ANOCOVA, Multivariate Analysis Technique Classification of Multivariate Analysis, factor Analysis, R-type Q Type factor Analysis, Path Analysis	10	20

Reference books:

1. "Research Methodology", C.R. Kothari, Wiley Eastern.
2. "Formulation of Hypothesis", Willkinson K.P, L Bhandarkar, Hymalaya Publication, Bombay.
3. "Research in Education", John W Best and V. Kahn, PHI Publication.
4. "Research Methodology- A step by step guide for beginners", Ranjit Kumar, Pearson
5. "Management Research Methodology-Integration of principles, methods and Techniques", K.N. Krishna swami and others, Pearson Education

Branch: MCA	**Semester-III**
Subject Code: 3105	**Lecture: 04** **Credit: 04**
Subject Title	**CYBER SECURITY AND LAW**

Modules	**Sr.. No.**	**Topic and Details**	**No of Lectures Assigned**	**Marks Weightage %**
UNIT-I	1	**Introduction to Cyber Security** Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber, terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace	4	10
	2	**Cyber Security Vulnerabilities and Cyber Security Safeguards** Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.	7	15
UNIT-II	3	**Securing Web Application, Services and Servers** Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.	8	10
	4	**Intrusion Detection and Prevention** Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-	8	15

		Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation		
UNIT-III	5	**Basic Concepts of Technology and Law:** Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence.	5	10
	6	**Law of Digital Contracts :** The Essence of Digital Contracts, The System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography, Intellectual Property Issues in Cyber, Space: Copyright in the Digital Media, Patents in the Cyber World.	5	10
UNIT-IV	7	**Rights of citizens and E-Governance:** Privacy and Freedom Issues in the Cyber World, E-Governance, Cyber Crimes and Cyber Laws, Ethical hacking. Information Technology Act 2000: Information Technology Act-2000- (Sec 1 to 94).	5	10
	8	**Cyber Law Issues for Management:** Cyber Law Issues in E-Business Management, Major issues in Cyber Evidence Management, Cyber Law Compliancy Audit. ITA-**2000**	4	10
	9	**INTELLECTUAL PROPERTY RIGHTS** **Basic Principles and Acquisition of Intellectual Property Rights:** Philosophical Aspects of Intellectual Property Laws, Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark, Basic Principles of Design Rights, International Background of Intellectual Property Information Technology Related Intellectual Property Rights.	4	10

Reference Books:

1. How to Register Your Own Copyright by Marx Warda, Sphinx Publishing
2. Licensing Art & Design by Caryn R. Leland, Allworth Press
3. A Professional's Guide to Licensing and Royalty Agreements by Caryn R. Leland Allworth Press IT2000 Bill
4. Web sites: online information, handouts
5. Digital Privacy and Security Using Windows: A Practical Guide By Nihad Hassan, Rami Hijazi, Apress
6. Cyber Crime Investigation, DSCI - Nasscom, 2013.
7. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices (With Cd) : Nina Gobole
8. Information systems control and Audit by Ron Weber, Pearson Pub.
9. Information security policies, procedures and standards by Thomas Pettier.
10. Information security Management Hand book- 5th Edition-HAROLD F. TIPTON
11. Computer security by Alfred Basta, Wolf Halton

12. Information security policies- Thomas R.Peltier, Pel

Branch: MCA	**Semester-III**
Subject Code: 3201	**Practical: 02** **Credit: 02**
Subject Title	**ADVANCED JAVA LAB**

Modules	**Sr. No:**	**Topics and Details**	**No.of Lectures/ Practicals assigned**	**Marks Weightage**
UNIT-I	1	Class	2	04
	2	Function Overloading	2	12
	3	Exceptional Handling	3	
UNIT-II	4	Multithreading	3	15
	5	Implementation of the URL, InetAddress.	3	
	6	JDBC,JSP, Servlet	2	04
UNIT-III	7	Java Beans, Implementation of JTrees, JTable	2	15
	8	Development and Deployment of Java APP on webserver, Appserver and Independent APP.	4	
UNIT-IV	9	Remote Method Invocation	2	

Branch: MCA	**Semester-III**
Subject Code: 3202	**Lecture: 04** **Credit: 04**
Subject Title	**NETWORK PROGRAMMING LAB**

List of Experiments

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
   - i. Program Using TCP Sockets Date and Time Server
   - ii. Implementation of Client-Server Communication Using TCP.
   - iii. Implementation of TCP/IP ECHO

2. Programs using UDP Sockets (like simple DNS)
   - i. Program using UDP Socket UDP Chat Server/Client
   - ii. DNS Server to Resolve a given Host Name
   - iii. UDP DNS server/client

3. Programs using Raw sockets (like packet capturing and filtering)
   - i. Packet Capturing and Filtering

4. Programs using RPC
    i. Client – Server Communication using RPC
    ii. Arithmetic Calculator using RPC-RMI

5. Simulation of sliding window protocols
6. Experiments using simulators
    i. Simple Topology Creation using NS - 2
    ii. User Datagram Protocol using NS -2
    iii. Transmission Control Protocol using NS - 2

7. Performance comparison of MAC protocols

8. Performance comparison of Routing protocols

9. Study of TCP/UDP performance
    i. Case Study 1: Study of UDP Performance
    ii. Case Study 2: Study of TCP Performance
    iii. Case Study 3: Study of Performance Comparison of TCP and UDP using NS – 2

SEMESTER IV

Branch: MCA	Semester-IV
Subject Code: 4101	Lecture: 04 Credit: 04
Subject Title	PYTHON PROGRAMMING

Modules	Sr.. No.	Topic and Details	No of Lectures Assigned	Marks Weightage %
UNIT-I	1	**Introduction:** The Python Programming Language, History, features, Installing Python, Running Python program, Debugging: Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, **Variables and Expressions** Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations. **Conditional Statements:** if, if-else, nested if –else **Looping:** for, while, nested loops **Control statements:** Terminating loops, skipping specific conditions	10	20
UNIT-II	2	**Functions**: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions?Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types **Strings:** A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations	10	20
	3	**Lists:** Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods **Tuples and Dictionaries**: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods Files: Text Files, The File Object Attributes, Directories Exceptions: Built-	10	20

		in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions		
UNIT-III	4	**Regular Expressions –** Concept of regular expression, various types of regular expressions, using match function. **Classes and Objects:** Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding **Multithreaded Programming:** Thread Module, creating a thread, synchronizing threads, multithreaded priority queue **Modules:** Importing module, Creating and exploring modules, Math module, Random module, Time module	10	20
UNIT-IV	5	**Creating the GUI Form and Adding Widgets:** **Widgets:** Button, Canvas,Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox. Handling Standard attributes and Properties of Widgets. **Layout Management:** Designing GUI applications with proper Layout Management features. **Look and Feel Customization:** Enhancing Look and Feel of GUI using different appearances of widgets. **Storing Data in Our MySQL Database via Our GUI :**Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.	10	20

Reference Books:

1. Think Python: Allen Downey O'Reilly 1st 2012
2. An Introduction to Computer Science using Python 3 :JasonMontojo, Jennifer Campbell, Paul Gries SPD 1st 2014
3. Python GUI Programming Cookbook: Burkhard A. Meier Packt 2015
4. Introduction to Problem Solving with Python: E. Balagurusamy TMH 1st 2016
5. Murach's Python programming: Joel Murach, Michael Urban SPD 1st 2017
6. Exploring Python: Budd TMH 1st 2016
7. Python Crash Course: A Hands-On, Project-Based Introduction to Programming

Branch: MCA	Semester-IV
Subject Code: 4102	Lecture: 04 Credit: 04
Subject Title	WEB TECHNOLOGY

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage
UNIT-I	1	**Introduction to Web Technologies:** Concepts of Internet, Concepts of World Wide Web, Internet based Services-Email, Telnet, FTP, WWW. Web Server, Web Hosting, DNS, SMTP.	2	25
	2	**HTML:** Introduction to HTML, Structure of HTML document, Basic HTML tags, attributes, Formatting tags, Meta Tags, Comments, Inserting Image, Image Maps, hyperlink, Tables, Lists, Frames, iframes, Marquee. HTML Form controls. Introduction to HTML5. **Angular JS:** Environment Setup, Creating and executing angular js application, directives, controllers, expressions, filters, tables, modules, forms, views, scopes, services.	8	
	3	**CSS:** Introduction to CSS, Types of CSS-Embedded Stylesheet, Inline Stylesheet, External StyleSheet, CSS Border, margin, Positioning, color, text, link, background, list, table, padding, image, display properties, Use of Id & classes in CSS ,use of & in CSS, Introduction of CSS3 : Gradients, Transitions, Animations, multiple columns.	6	
Unit-II	4	**XML:** Introduction to XML, Valid and Well-Defined Document, Document Type Definition or DTD, uses of DTD, XML Tags, Elements, Attributes, PCDATA, CDATA, Basics of entities, XML Elements , Elements Declaration, usage of #REQUIRED , usage of #IMPLIED, usage of #FIXED, Internal Entities, External Entities, XML Schema, Defining, Accessing XML Document.	6	25
	5	**Clint Side Scripting Language: Javascript** Introduction to javascript, Variables, identifiers constants in javascript, Types of Operators in javascripts, Control and looping structure,arrays in JavaScript, Event handling	10	

		in javascript, JavaScript Objects-Number, Boolean, Strings, Arrays, Date, Math, Regular Expression, JavaScript Document Object Model (DOM), Window Object, Navigator Object, Location Object, History Object . Validations in JavaScript. **JQuery:** Introduction to JQuery, Selectors, attributes, Traversing, CSS, DOM, Events, AJAX, Effects, Interactions, Widgets, Theming.		
Unit-III	6	**Server Side Scripting Language: PHP** Configuration and Installation of PHP, Variables Types, Constants, Types of Operators, Arrays, Strings, Decision and Looping Statements. Processing HTML form using GET, POST, REQUEST, SESSION, COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables. CMS: Wordpress	10	25
Unit-IV	7	Introduction to CGI Programming, JSP, Servlet, AJAX. Creation of .jar project. Deployment of Java application on Appserver.	8	25

Reference Books:

1. Beginning Web Programming with HTML, XHTML, CSS & JavaScript by Jon Duckett, Wrox.
2. Webmaster in a Nutshell by Stephen Spainhour, O'Reilly and Associates.
3. JavaScript: The Definitive Guide by David Flanagan, O'Reilly and Associates.
4. Beginning ASP 3.0 by David Buser and Others, Wrox.

Branch: MCA	**Semester-IV**
Subject Code: 4103	**Lecture: 04** **Credit: 04**
Subject Title	**MANAGERIAL ECONOMICS**

Modules	**Sr. No.**	**Topic and Details**	**No of Lectures Assigned**	**Marks Weightage**
	1	Economic analysis , Microeconomics and macroeconomics , Analysis of consumer behavior :	6	12

UNIT-I	2	Law of demand and supply, Utility analysis/indifference curves, Revealed preference theory, Elasticity of demand, Consumer surplus. 1.Breakeven point 2.Demand Forecasting	8	16
UNIT-II	3	The Firm: Theory of production : Production function, ISO product curves, Cost analysis, Optimum firm	8	16
	4	Theory of product pricing: Revenue concepts, Equilibrium of the firm & industry under perfect Competition, monopoly, monopolistic competition, Oligopoly & duopoly	10	20
UNIT-III	5	Theory of Factory pricing : Marginal productivity theory of distribution and Modern theory : Theories of rent, wages, interest & profit, Risk and uncertainly	10	20
UNIT-IV	6	The economy : National income Concepts: . Savings – investments, Applications of Harrod - Domar Model, International trade and balance of payments.	4	8
	7	The financial system, Money: Definition and uses, Demand and supply of money, Commercial banking systems	4	8

REFERENCE BOOKS:

1. R.L.Varshney , KL Maheshwari " Managerial Economics Sultan Chand & Sons
2. D.N.DWIVEDI "Managerial Economics Vikas Publication.
3. I.C.DHINGRA "Essential of Managerial Economics Sultan Chand & Sons Publications
4. RUDDAR DATT K.P.M.SUNDRAM "Indian Economy" 54th edition S.Chand & Company Ltd.

Branch: MCA	**Semester-**
Subject Code: 4104	**Lecture: 04** **Credit: 04**
Subject Title	**DATA WAREHOUSING AND DATA MINING**

Modules	**Sr No.**	**Topic Details**	**No. of Lectures Assigned**	**Marks Weightage**
UNIT-I	1	**Data Warehousing:** **Overview And Concepts:** Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing.	2	08
	2	**Planning And Requirements:** Project planning and management, Collecting the requirements.	2	
		Architecture And Infrastructure: Architectural components, Infrastructure and metadata.	4	

	3	**Data Design And Data Representation:** Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data quality.	4	16
UNIT-II	4	**Information Access And Delivery:** Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web.	4	16
	5	**Implementation And Maintenance:** Physical design process, data warehouse deployment, growth and maintenance.	4	
	6	**Data Mining:** **Introduction:** Basics of data mining, related concepts, Data mining techniques.	4	16
	7	**Data Mining Algorithms:** Classification, Clustering, Association rules.	4	
UNIT-III	8	**Knowledge Discovery :** KDD Process **Web Mining:** Web Content Mining, Web Structure Mining, Web Usage mining.	6	24
	10	**Advanced Topics:** Spatial mining, Temporal mining. **Visualisation :** Data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, Mining class comparisons: Discriminating between different classes, Mining descriptive statistical measures in large databases	6	
UNIT-IV	11	**Data Mining Primitives, Languages, and System Architectures:** Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems	6	20
	12	**Application and Trends in Data Mining:** Applications, Systems products and research prototypes, Additional themes in data mining, Trends in data mining	4	

REFERENCE BOOKS:

1. Paulraj Ponnian, .Data Warehousing Fundamentals., John Wiley.
2. M.H. Dunham, .Data Mining Introductory and Advanced Topics., Pearson Education.
3. Han, Kamber, .Data Mining Concepts and Techniques., Morgan Kaufmann
4. Ralph Kimball, .The Data Warehouse Lifecycle toolkit., John Wiley.
5. M Berry and G. Linoff, .Mastering Data Mining., John Wiley.
6. W.H. Inmon, .Building the Data Warehouses., Wiley Dreamtech.
7. E.G. Mallach, .Decision Support and Data Warehouse systems., TMH.

Branch: MCA	Semester-IV
Subject Code: 4201	Practical: 02 Credit: 02
Subject Title	PYTHON PROGRAMMING LAB

Modules	Sr. No:	Topics and Details	No.of Lectures/ Practicals assigned	Marks Weightage
UNIT-I	1	Fibonacci series, reverses the user defined value. function for Palindrome.	4	05
	3	Armstrong, factorial for a given number, program for printing given pattern, concept of inheritance using python	4	05
UNIT-II	4	Python script to sort (ascending and descending) a dictionary by value and to sum all the items in a dictionary	8	10
UNIT-III	5	To configure the widget with various options like: bg="red", family="times", size=18 To change the widget type and configuration options to experiment with other widget types like Message, Button, Entry, Checkbutton, Radiobutton, Scale etc.	5	15
UNIT-IV	6	**Design the database applications** • Design a simple database application that stores the records and retrieve the same • Design a database application to search the specified record from the database. • Design a database application to that allows the user to add, delete and modify the records.	4	15

Reference Books:

1. Think Python: Allen Downey O'Reilly 1st 2012
2. An Introduction to Computer Science using Python 3 :JasonMontojo, Jennifer Campbell, Paul Gries SPD 1st 2014
3. Python GUI Programming Cookbook: Burkhard A. Meier Packt 2015

Branch: MCA	Semester-IV
Subject Code: 4202	Lecture: 04 Credit: 04
Subject Title	WEB TECHNOLOGY LAB

List of Practical

(i) Install the following on the local machine
- Apache Web Server
- Tomcat Application Server locally
- Install MySQL
- Install PHP and configure it to work with Apache web server and MySQL

(ii) Design a static web application using HTML features.

(iii) Style the web application using different types of stylesheets.

(iv) Create a webpage using XML.

(v) Implement the features of Angular JS in your application.

(vi) Create a registration and feedback form in your web application. Apply client side validations using JavaScript.

(vii) Create an application to show the working of JavaScript event handlers.

(viii) Design and build rich interactive web applications using JQuery.

(ix) Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

(x) Write a program to implement MVC architecture.

(xi) Create a rich interactive web application using PHP and MySQL. Use features like sessions and cookies in the application.

Branch: MCA	Semester-IV
Subject Code: 4111	**Lecture: 04** **Credit: 04**
Subject Title	**ELECTIVE-I** **DATA SCIENCE**

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage
UNIT-I	1	Introduction: What is Data Science? - Big Data and Data Science hype {and getting past the hype - Why now? { Data_cation - Current landscape of perspectives - Skill sets needed	2	5
	2	Statistical Inference - Populations and samples - Statistical modeling, probability distributions, Fitting a model	2	5
	3	Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA- The Data Science Process - Case Study: RealDirect (online real estate firm)	8	15
UNIT-II	4	Three Basic Machine Learning Algorithms - Linear Regression - k-Nearest Neighbors (k-NN) - k-means	10	20
	5	One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam - Data Wrangling: APIs and other tools for scrapping the Web		
UNIT-III	6	Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer) retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms { Filters; Wrappers; Decision Trees; Random Forests}	6	10

	7	Recommendation Systems: Building a User-Facing Data Product - Algorithmic ingredients of a Recommendation Engine - Dimensionality Reduction - Singular Value Decomposition - Principal Component Analysis - Exercise: build your own recommendation system	6	10
UNIT-IV	8	Mining Social-Network Graphs - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighborhood properties in graphs	8	15
	9	Data Visualization - Basic principles, ideas and tools for data visualization - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset	4	10
	10	Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists	4	10

Reference Books:

1. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.
2. Jure Leskovek, Anand Rajaraman and Je_rey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
3. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
4. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
5. Trevor Hastie, Robert Ti
6. bshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
7. Mohammed J. Zaki andWagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
8. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

Branch: MCA	Semester-IV
Subject Code: 4112	Lecture: 04 Credit: 04
Subject Title	Elective I SOFTWARE TESTING AND TOOLS

Modules	Sr No.	Topic Details	No. of Lectures Assigned	Marks Weightage
UNIT-I	1	Software Testing Terminology and Methodology Software Testing Terminology, Software Testing Life Cycle, Writing a Policy for Software Testing, Economics of Testing, Testing – An organizational Issue, Management Support for Software Testing, Fig. of Software Testing Methodology, Risk associated with not meeting customer needs, Developing Test Strategy	4	14
	2	Overview of Software Testing Process Advantages of Following a Process, The Cost of Computer Testing, The Seven-Step Software Testing Process	3	
		Verification and Validation Verification and Validation (V&V) Activities, Verification, Verification of Requirements, Verification of High –level Design, Verification of Low –level Design, How to Verify Code?	3	10
	3	Static Testing Inspections, Structured Walkthroughs , Technical Reviews	2	
UNIT-II	4	Validation Activities Unit Validation Testing, Integration Testing, Function Testing, System Testing , Acceptance Testing	3	06
	5	Regression Testing Progressive vs. Regressive Testing, Regression Testing Produces Quality Software, Regression Testability, Objectives of Regression Testing, When is Regression Testing Done? , Regression Testing Types, Defining Regression Test Problem, Regression Testing Techniques	6	12
UNIT-III	6	Test Management Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design and Test Specifications	4	8
	7	Software Metrics Need for Software Management, Definition of Software Metrics, Classification of Software Metrics, Entities to be Measured, Size Metrics	4	8

	8	Testing Metrics for Monitoring and Controlling the Testing Process Measurement Objectives for Testing, Attributes and Corresponding Metrics in Software Testing, Attributes, Estimation Models for Estimating Testing Efforts (include only topic Halstead Metrics), Test Point Analysis (TPA) – introduction only	5	10
UNIT-IV	**9**	Testing Process Maturity Models Need for Test Process Maturity, Measurement and Improvement of a Test Process, Test Process Maturity Models	4	8
	10	Automation and Testing Tools Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Cost Incurred in Testing Tools, Guidelines for Automated Testing, Overview of Some Commercial Testing Tools Testing Object Oriented Software Object- Oriented Testing	6	12
	11	Using Agile Methods to Improve Software Testing The importance of Agility, Building an Agile Testing Process, Agility Inhibitors, Is Improvement Necessary, Compressing Time, Challenges, Solutions , Measuring Readiness , The Seven-Step Process 4.5 Test Plan	6	12

REFERENCE BOOKS:

1. Software Testing Principles and Practices - By Naresh Chauhan, Oxford
2. Effective Methods of Software Testing (3rd Edition) - By William E Perry Wiley, India
3. Software Testing principles and practices- By Srinivasan Desikan, Gopalaswamy Ramesh,Pearson Ed.
4. Software testing (2nd Edition) – By Ron Patton, Pearson Education
5. Effective Software Testing 50 specific ways to improve your testing- By Elfriede Dustin, Pearson Edu.

Branch: MCA	Semester-IV
Subject Code: 4113	Lecture: 04 Credit: 04
Subject Title	Elective I COMPUTER GRAPHICS

Modules	Sr. No.	Topic and Details	No. of lectures assigned	Marks Weightage
UNIT-I	1	A Brief background about applications of Computer Graphics, Overview of Graphics Systems, Video display devices, Refresh cathode ray tubes, Raser and random scan displays, colour CRT monitors, Flat panal displays, LCDs. Design and architecture of raster scan and random scan display systems. A brief introduction to input devices nad hardcopy devices. Output primitives, DDA and Bresenham's 2D line drawing algorithms, Parallel line algorithms.	8	16
UNIT-II	2	Midpoint circle generating algorithm, Ellipse generating algorithm, Other curves, Filled area primitives, Scan line polygon fill algorithm, Inside outside test, Boundary fill algorithm, Flood fill algorithm, Character generation, Attributes of output primitive, line and curve attributes, Character attributes.	10	20
UNIT-III	3	Anti-aliasing, Two dimensional geometric transformations, Composite transformations, General Composite Transformations and Computational Efficiency, Other transformations, Affine transformation, Two dimensional viewing, Window to viewport coordinate transformation.	8	16
	4	Clipping operations, Cohen Sutherland lnie clipping, Liang Barsky line clipping, Nicholl-Lee-Nicholl line clipping, polygon clipping, Sutherland Hodgeman and Weiler Atherton Polygon clipping, Text and curve clipping. Three dimensional concepts, Display methods, polygon surfaces, quadric surfaces and super quadrics.	12	24
UNIT-IV	5	Three dimensional Geometric and Modelling Transformations, General three dimensional rotation, Three dimensional viewing pipeline, Projections, Parallel and perspective projection, View volume and general Projective transformation. Visible Surface Detection Methods, Back Face detection, Depth Buffer Method, A buffer method, Depth sorting method.	12	24

Reference Books: -

1. Donald Hearn and M. Pauline Baker, Second Edition, Prentice Hall of India, 1997.
2. J.D. Foley, A van Dam, S.K. Feiner, J.F. Hughes, Addison Wesley Publ. Company, 1997.

3. Jim Blinn, Jim Blinn's Corner: A trip Down the Graphics Pipeline, Morgan Kaufman,2000.

Branch: MCA	**Semester-IV**
Subject Code: 4114	**Lecture: 04** **Credit: 04**
Subject Title	**ELECTIVE-I** **ENTERPRISE RESOURCE PLANNING**

Modules	**Sr. No.**	**Topic and Details**	**No of Lectures Assigned**	**Marks Weightage**
UNIT-I	1	**Introduction to Enterprise Resource Planning (ERP)** Information System and Its Components, Value Chain Framework, Organizational Functional Units, Evolution of ERP Systems, Role of ERP in Organization, Three-Tier Architecture of ERP system.	4	5
	2	**ERP and Implementation** ERP implementation and strategy, Implementation Life cycle, Pre implementation task, requirement definition, implementation	4	10
UNIT-II	3	**ERP Business Modules** Finance, manufacturing, human resources, quality management, material management, marketing, Sales distribution and service.	10	20
	4	Case study on Supply Chain management (SCM), Customer relationship Management (CRM)	4	10
UNIT-III	5	**Introduction to ERP related Technologies** Business Process Re-engineering (BPR) ,Data warehousing ,Data Mining, On- line Analytical Processing(OLAP), Product Life Cycle Management (PLM) Geographical Information Management ,RFID, QR Code ,Bar Coding, E-commerce and their application in Enterprise planning.	10	25
UNIT-IV	7	**Extended ERP and security issues** Enterprise application Integration (EAI), open source ERP, cloud ERP Managing ERP Securities: Types of ERP security Issues, System Access security, Data Security and related technology for managing data security	10	20
	8	**Case Studies and Presentations** – Case study to cover full enterprise layer with SCM, CRM and ERP combined with Enabled organization	8	10

Reference Books:

1. Alexis Leon, ERP Demystified: II Edition, Tata McGraw Hill.
2. Rajesh Ray, Enterprise Resource Planning, Text and cases, Tata McGraw Hill.
3. Sandeep Desai, Abhishek Srivastava, ERP to E2 ERP: A Case study approach, PHI.
4. Jyotindra Zaveri, Enterprise Resource Planning, Himalaya Publishing House, 2012.
5. V.K. Garg & N.K. Venkatakrishnan, Enterprise Resource Planning: concepts & practices, by ; PHI.
6. Supply Chain Management Theories & Practices: R. P. Mohanty, S. G. Deshmukh, - Dreamtech Press.
7. Enterprise wide resource planning: Theory & practice: by Rahul Altekar, PHI
8. Customer Relationship Management, Concepts and cases, Second Edition.

SEMESTER V

Branch: MCA	Semester-V
Subject Code: 5101	Lecture: 04 Credit: 04
Subject Title	MOBILE APPLICATION DEVELOPMENT

Modules	Sr.No.	Topic and Details	No of Lectures Assigned	Marks Weightage
Unit I	1.	What is Android, Android versions and its feature set The various Android devices on the market , The Android Market application store ,Android Development Environment - System Requirements, Creating Android Virtual Devices (AVDs)	5	10
Unit II	2.	Android Software Development Platform, The Directory Structure of an Android Project , Common Default Resources Folders , The Values Folder , Leveraging Android XML, Screen Sizes , Launching Your Application: The AndroidManifest.xml File ,Creating Your First Android Application	5	20
Unit III	3.	Android Application Components, Android Activities: Defining the UI, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications Content Providers: Data Management, Android Intent Objects: Messaging for Components Android Manifest XML: Declaring Your Components, Designing for Different Android Devices, Views and View Groups, Android Layout Managers, The View Hierarchy, Designing an Android User Interface using the Graphical Layout Tool	10	15
	4.	Displaying Text with TextView, Retrieving Data from Users, Using Buttons, Check Boxes and Radio Groups, Getting Dates and Times from Users, Using Indicators to Display Data to Users, Adjusting Progress with SeekBar, Working with Menus using views, Gallery, ImageSwitcher, GridView, and ImageView views to display images, Creating	10	20

		Animation		
Unit IV	5.	Intent Overview, Implicit Intents, Creating the Implicit Intent Example Project, Explicit Intents, Creating the Explicit Intent Example Application, Intents with Activities, Intents with Broadcast Receivers,An Overview of Threads, The Application Main Thread, Thread Handlers, A Basic Threading Example, Creating a New Thread, Implementing a Thread Handler, Passing a Message to the Handler	10	20
	6.	Sending SMS Messages Programmatically, Getting Feedback after Sending the Message Sending SMS Messages Using Intent Receiving, sending email, Introduction to location-based service, configuring the Android Emulator for Location-Based Services, Map-Based Activities Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures	10	15

Reference Books

1. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, Big Nerd Ranch LLC, *3rd edition*, 2017.
2. Christian Keur and Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, *6th edition*, 2015.
3. Raoul-Gabriel Urma, Mario Fusco, and Alan Mycroft, Java 8 in Action: Lambdas, Streams, and Functional-Style Programming, Manning Publications, 2015.
4. Benjamin J. Evans and Martijn Verburg, The Well-Grounded Java Developer: Vital Techniques of Java 7 and Polyglot Programming, Manning Publications, 2013.
5. Brian Fling, Mobile Design and Development, O'Reilly Media, 2009
6. Maximiliano Firtman, Programming the Mobile Web, 2nd ed., O'Reilly Media, 2013.
7. Christian Crumlish and Erin Malone, Designing Social Interfaces, O'Reilly Media, 2015.
8. Benjamin Muschko, Gradle in Action, Manning Publications, 2014.
9. Craig Larman, Applying UML and Patterns: A Guide to Object-Oriented Analysis and Design and Iterative Development, 3rd ed., Prentice Hall, 2004.

Branch: MCA	Semester-V
Subject Code: 5102	Lecture: 4 Credit: 4
Subject Title	DECISION MAKING AND MATHEMATICAL MODELLING

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage
UNIT-I	1	**Mathematical logic** Propositions and logical operations, Conditional Statements , Methods of Proof , Mathematical Induction, Mathematical Statements , Logic and Problem Solving, Normal Forms	5	10
	2	**Sets and Relations** Set operations and functions, Product sets and partitions, Relations and digraphs, Paths in Relations and Digraphs, Properties of Relations , Equivalence Relations, Operations on Relations, Partially Orders Sets, Hasse diagram	8	15
	3	**Graphs** Graph, Representation of Graph, Adjacency matrix, Adjacency list, Euler paths and Circuits, Hamiltonian Paths and Circuits	8	15
UNIT-II		**Mathematical Models** - Vehicular Stopping Distance Modeling using decision theory : Probability and Expected Value (e.g. Rolling the Dice, Life Insurance, Roulette etc) Decision Trees , Classification problems using Bay" s theorem	5	10
	5	**Modeling using difference equation** Recurrence relation - Fibonacci series, Tower of Hanoi ,Lines in a plane Homogenous linear equations with constant coefficients, Particular Solution, Total Solution, Divide and Conquer Recurrence Relations (Fast Multiplication of Integers, Fast matrix Multiplication)	8	20
UNIT-III	6	**Characteristics of Complex Business Problems** Number of Possible Solutions, Time-Changing Environment, Problem-Specific Constraints, Multi-objective Problems, Modeling the Problem A Real-World	8	15

UNIT-IV	7	**MADM & MCDM** Introduction to Multiple Attribute Decision-making (MADM) Multiple Attribute Decision-making Methods, Simple Additive Weighting (SAW) Method, Weighted Product Method (WPM), Analytic Hierarchy Process (AHP) Method, Entropy Method, Compromise Ranking Method (VIKOR), Weighted Average Method (WAM) Introduction to Multiple Criteria Decision Making (MCDM)	8	15

Reference Books :

1. Discrete Mathematics and Its Applications 4 th Edition , Kenneth H. Rosen ,McGraw Hill
2. A First Course in Mathematical Modeling 5th Edition, Frank R. Giordano, William P. Fox, Steven B. Horton
3. Adaptive Business Intelligence,F 1st Edition by Zbigniew Michalewicz, Martin Schmidt, Matthew Michalewicz, ConstantinChiriac, Springer Publication
4. Decision Making in the Manufacturing Environment Using Graph Theory and Fuzzy Multiple Attribute Decision Making Methods,1st Edition by R. VenkataRao, Springer Publication
5. Discrete Mathematical structures 4 th Edition, Kolman, Busby, Ross, PHI
6. Discrete Mathematics : SemyourLipschutz, VarshaPatilIINd Edition Schaum‟ s Series TMH
7. Data Mining: Introductory and Advanced Topics ,3rd Edition, Dunham , Sridhar

Branch: MCA	**Semester-V**
Subject Code: 5103	**Lecture: 04** **Credit: 04**
Subject Title	**ARTIFICIAL INTELLIGENCE**

Modules	**Sr. No.**	**Topic and Details**	**No of Lectures Assigned**	**Marks Weightage**
UNIT-I	1	**Introduction:** Overview of AI, Importance of AI, History, related fields, Representation of Knowledge, Knowledge Base Systems, State Space Search Problem Characteristics of 8- Queens, Traveling Salesman, Missionary & Cannibals, Crypt, Arithmetic, Monkey Banana Problem, Tower of Hanoi and Block World.	8	16

UNIT-II	2	**Searching Methods:** Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS) , Depth Limited Search, Depth First Iterative Deepening(DFID), Informed Search Methods: Greedy best first Search ,A* Search , Memory bounded heuristic Search. Local Search Algorithms and Optimization Problems: Hillclimbing search Simulated annealing, Local beam search, Genetic algorithms. Adversarial Search: Games, Optimal strategies, The minimax algorithm, Alpha-Beta Pruning.	10	20
	3	**Predicate & Logic:** Representing simple facts in Logic -Computable functions in predicates, resolution – unification – forward vs. backward reasoning. , Probabilistic reasoning – Bayes's Theorem – Certainty Factors– Demphster–Shafer Theory – Fuzzy , Sets, Reasoning with Fuzzy Logic, Natural Language Computation with Fuzzy Logic.	10	20
UNIT-III	4	**Structured Knowledge Representation:** Associative Networks, Semantic Nets, Frames Structures, Conceptual, Dependencies & Scripts, Learning – Concept of Learning – Learning Automata, Learning by induction. **Natural Language Processing:** Overview of Linguistics, Grammars and Languages, basic Parsing techniques, semantic analysis, and representation structures. Natural Language generation and Natural Language Systems.	12	24
UNIT-IV	5	**Expert Systems:** Architecture – Need and Justification of Expert Systems –Knowledge acquisition and validation. Perception and Action,Real time search, perception, action, vision, robot architecture , Learning in Neural Networks – Applications – Hopfield Networks, Backpropagation , Case Study -XCON, PROSPECTOR	10	20

Reference Books

1. Introduction to AI and Expert Systems - Patterson.
2. Artificial Intelligence A Modern Approach- Stuart Rushell
3. Artificial Intelligence - Rich E and Knight K
4. Principles of Artificial Intelligence - Nilsson.
5. Artificial Intelligence – An Engineering Approach - Schalkoff R J
6. Introduction to Expert System - Peter Jackson

7. Artificial Intelligence - Janakiraman

Branch: MCA	**Semester-V**
Subject Code: 5104	**Lecture: 04** **Credit: 04**
Subject Title	**SOFTWARE PROJECT MANAGEMENT**

Modules	**Sr. No.**	**Topic and Details**	**No of Lectures Assigned**	**Marks Weightage**
UNIT-I	1	**An overview of IT Project Management** 1.1 Introduction, the state of IT projects management, context of project management, need of project management, project goals, project life cycle and IT development, extreme project management, PMBOK.	4	10
	2	**Conceptualizing and Initializing the IT Project** 2.1 An information technology project methodology (ITPM), project feasibility, request for proposal (RFP), the business case, project selection and approval, project contracting, IT governance and the project office.	4	10
	3	**The Human Side of Project Management** 3.1 Introduction, organization and project planning, the project team, the project environment.	4	10
UNIT-II	4	**Developing the Project Charter and Project Plan** 4.1 Introduction, project management process, project integration management, the project charter, project planning framework, the contents of a project plan, the planning process. 4.2 The Work Breakdown Structure (WBS), the linear	8	10
	5	**The Scope Management Plan** 5.1 Introduction, scope planning, project scope definition, project scope verification, scope change control.	4	5
	6	**The Project ís Schedule, Budget and Risk Management** 6.1 Introduction, developing the project schedule, project management software tools, methods of budgeting, developing the project control, risk responses and evaluation. Budget,improving cost estimates, finalizing the project schedule and budget. 6.2 IT project risk management planning process, identifying IT project	8	15
UNIT-III	7	**Allocating Resources to the Project** 7.1 Resource loading, resource leveling, allocating scarce resources to projects and several projects, Goldrattís critical chain.	8	10

	8	**The Project Communication Plan** 8.1 Introduction, monitoring and controlling the project, the project communications plan, project metric, project control, designing the control system, the plan-monitor-control cycle, data collection and reporting, reporting performance and progress, information distribution.	2	5
UNIT-IV	9	**Managing Change, Resistance and Conflicts**	2	3
	10	**Managing Project Procurement and Outsourcing** 10.1 Introduction, project procurement management,	2	2
	11	**Project Leadership and Ethics** 11.1 Introduction, project leadership, ethics in projects, multicultural projects.	2	5
	12	**The Implementation Plan and Project Closure** 12.1 Introduction, project implementation, administrative closure, project	2	5

Reference Books:

1. S. J. Mantel, J. R. Meredith and etl.. "Project Management" 1st edition, Wiley India, 2009.
2. John M. Nicholas, "Project Management for Business and Technology", 2nd edition, Pearson Education.
3. Joel Henry, "Software Project Management, A real-world guide to success", Pearson Education, 2008.
4. Gido and Clements, "Successful Project Management", 2nd edition, Thomson Learning.
5. Hughes and Cornell, "Software Project Management", 3rd edition, Tata McGraw Hill
6. Joseph Phillips, "IT Project Management", 2nd edition, Tata McGraw Hill
7. Robert K. Wyzocki and Rudd McGary, "Effective Project Management", 3rd edition, Wiley
8. Brown, K.A. Project Management, McGraw Hill, 2002.
9. E-Book – Project Management Body of Knowledge.
10. Dinsmore, P. C. (Ed.). (1993) The AMA Handbook of Project Management. AMACOM
11. Information Technology Project Management, Jack T. Marchewka, 3rd edition, Wiley India, 2009.

Branch: MCA	Semester-V
Subject Code: 5201	Lecture: 04 Credit: 04
Subject Title	BUSINESS INTELLIGENCE LAB

Modules	Sr. No:	Topics and Details	No.of Lectures/ Practicals assigned	Marks Weightage
UNIT-I	1	Business Intelligence Essentials: Introduction, Creating Business Intelligence Environment, Business Intelligence Landscape, Types of Business Intelligence, Business Intelligence Platform, Dynamic roles in Business Intelligence, Roles of Business Intelligence in Modern Business.	10	10
UNIT-II	2	Business Intelligence Types: Introduction, Multiplicity of Business Intelligence Tools, Types of Business Intelligence Tools, Modern Business Intelligence, the Enterprise Business Intelligence, Information Workers	5	20
UNIT-III	3	Case Study and Application	5	10
UNIT-IV	4	BI Software Installation	5	10
Mini project based on BI Applications				

Reference Books:

1. Business Intelligence: Data Mining and Optimization for Decision Making by Carlo Vercellis
2. Data Mining – Principles and Applications by Kumar, Elsevier

Branch: MCA	Semester-V
Subject Code: 5202	Lecture: 04 Credit: 04
Subject Title	MOBILE APPLICATION DEVELOPMENT LAB

Modules	Sr. No:	Topics and Details	No.of Lectures/ Practicals assigned	Marks Weightage
UNIT-I	1	**Introduction to Android** What is Android? Setting up development environment, Dalvik Virtual Machine & .apk file extension, Fundamentals : a) Basic Building blocks – Activities,Services,Broadcast Receivers & Content providers b) UI Components- Views & notifications c) Components for communication -Intents & Intent Filters,	2	04
	2	**Application Structure(in detail)** AndroidManifest.xml, • uses-permission & uses-sdk • Activity/services/receiver declarations, Resources & R.java, Assets, Values – strings.xml Layouts & Drawable Resources, Activities and Activity lifecycle, First sample Application,Deploying sample application on a real device	3	10
UNIT-II	3	**Emulator-Android Virtual Device:** Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to DDMS, File explorer,	2	
	4	Second App :- (switching between activities), Develop an app for demonstrating the communication between Intents **Basic UI design: ,**Form widgets, Text Fields, Layouts, • RelativeLayout ,TableLayout, FrameLayout, LinearLayout , Nested layouts, [dip,dp,sip,sp] versus px **Preferences,** SharedPreferences, Preferences from xml, Examples, **Menu** Option menu, Context menu, Sub menu, menu from xml, menu via code, Examples, **Intents (in detail),** Explicit Intents, Implicit intents, Examples, **UI design** Time and Date, Images and media, Composite, AlertDialogs & Toast, Popup, Examples , **Tabs and TabActivity,** Examples, **Styles & Themes,** styles.xml, colors.xml- declaring colors and drawables, Drawable resources for shapes, gradients(selectors), • Shapes drawables, • State drawables, Transition drawables, Patch drawables style attribute in layout file Applying	4	16

		SQLite Programming: SQLite Programming, SQLiteOpenHelper, SQLiteDatabse, Cursor Content providers, • Defining and using content providers, • Example- Sharing database among two different applications using content, providers, Reading and updating Contacts, Reading bookmarks, Example : - Develop an App to demonstrate database usage. CRUD operations must be, implemented. Final details should be viewed in GridView as well as in, ListView., Do the same application with database operations in a single class(As a Model class) and do the CRUD operations with this class object	5	10
UNIT-III	5	**Android Debug Bridge(adb) tool Linkify** Web URLs,Email address,text,map address,phone numbers, MatchFilter & , ransformFilter, Examples **Adapters and Widgtes:** Adapters :-, a) ArrayAdapters, b) BaseAdapters, Example - Efficient Adapter , ListView and ListActivity, Custom listview, GridView using adapters, Gallery using adapters ,Examples **Notifications: ,** Broadcast Receivers , Services and notifications, Toast, Alarms,Examples **Custom components :** Custom Toast, Custom dialogs, Custom Tabs, Custom animated popup , panels,Other components,Examples	3	
UNIT IV	6	**Threads:** Threads running on UI thread(runOnUiThread), Worker thread, Handlers & Runnable, AsynTask(in detail), Examples	3	10
	7	**Advanced:** Live Folders, Using sdcards – Reading and writing, XML Parsing, JSON Parsing, Including external libraries in our application, Maps via intent and	3	

Reference Books:

1. Professional Android 2 Application Development Paperback, John Wiley & Sons, Inc. (10) Reto Meier

Branch: MCA	Semester-V
Subject Code: 5121	Lecture: 04 Credit: 04
Subject Title	ELCTIVE II IMAGE PROCESSING

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weightage
UNIT-I	1	Analog, discrete and digital signals, 1D, 2-D signals with examples. Discrete time signals: sequences, Discrete time systems LTI systems and their properties. Convolution and Correlation- need, methods and examples	8	5
	2	Introduction Digital Image Processing: Introduction: Definition of digital image, generation of digital image, steps in digital image processing, 2D sampling, spatial and onal resolutions, pixel connectivity, Elements of digital image processing system.	10	10
	3	Image enhancement in spatial domain Point operations, Histogram Processing, Spatial Filtering, smoothing Sharpening, median, highboost.	8	10
UNIT-II	4	Introduction to image in frequency domain Concept of Basis Images, D.F.T. and its properties, two dimensional F.F.T. Filtering in the frequency domain: smoothening, sharpening and homomorphic filtering.	12	15
	5	Image Segmentation Detection of discontinuities, edge linking and Boundary detection, Hough Transform, thresholding region oriented segmentation.	12	15
	6	Image representation and Description Boundary descriptors: shape number, Fourier descriptors, Statistical moments, Regional descriptors	15	15
UNIT-III	7	Image data compression: Image data redundancies: coding, inter-pixel, psychovisual; Fundamentals of lossless compression: Arithmetic coding, Huffman coding, LZW coding, RLE, Bit plane coding, predictive coding. Lossy compression: JPEG, Subband coding, Vector Quantization, Image compression Standards. Fidelity criteria.	20	20
UNIT-IV	8	Image morphology Morphological operation: Dilation erosion , Opening & Closing, Hit or Miss Transform, Basic Morphological Algorithms	15	10

Reference Books:

1. Gonzalez & Woods, Digital Image Processing, Pearson Education, Third Edition.
2. W. Pratt, Digital Image Processing, Wiley Publication, Fourth Edition, 2013.
3. J. G. Proakis and D. G. Manolakis, Digital Signal processing Principals,Algorithms and Applications,PHI publications, Third edition,
4. Milan Sonka , Digital Image Processing and Computer Vision, Thomson publication, Second Edition.2007.
5. A.K. Jain, Fundamentals of Image processing, Prentice Hall of India Publication, 1995
6. Gonzalez & Woods, Digital Image Processing using MATLAB, Pearson Education
7. S.Jayaraman, S Esakkirajan and T Veerakumar, Digital Image Processing ,McGraw Hill Education (India) Private Limited, New Delhi, 2009.
8. S.Sridhar, Digital Image Processing ,Oxford University Press, New Delhi, 2011.

Branch: MCA	**Semester-V**
Subject Code: 5122	**Lecture: 04** **Credit: 04**
Subject Title	**ELCTIVE II** **DIGITAL FORENCICS**

Module	**Sr. No.**	**Detailed Contents**	**Hrs.**	**Weightage**
UNIT-I	01	**Introduction:** 1.1 Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response, Phase after detection of an incident.	09	10
UNIT-II	02	**Initial Response and forensic duplication** 2.1 Initial Response & Volatile Data Collection from Windows system - Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. 2.2 Duplicate/Qualified Forensic Duplicate of a Hard Drive.	08	20
UNIT-III	03	**Preserving and Recovering Digital Evidence** 3.1 File Systems: FAT, NTFS - Forensic Analysis of File Systems – Storage, Fundamentals: Storage Layer, Hard Drives Evidence Handling: Types of Evidence, Challenges in evidence handling, Overview of evidence handling	09	20

		procedure.		
	04	**Network Forensics** 4.1 Intrusion detection; Different Attacks in network, analysis Collecting Network Based Evidence - Investigating Routers - Network Protocols - Email Tracing- Internet Fraud.	07	15
UNIT-IV	05	**System investigation** 5.1 Data Analysis Techniques - Investigating Live Systems (Windows & 08 Unix) Investigating 5.2 Hacker Tools - Ethical Issues – Cybercrime.	08	20
	06	**Bodies of law** 6.1 Constitutional law, Criminal law, Civil law, Administrative regulations, Levels of law: Local laws, State laws, Federal laws, International laws , Levels of culpability: Intent, Knowledge, Recklessness, Negligence Level and burden of proof : Criminal versus civil cases ,Vicarious liability, Laws related to computers: CFAA, DMCA, CAN Spam, etc.	09	15

Reference Books:

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGrawHill, 2006
2. Peter Stephenson, "Investigating Computer Crime: A Handbook for Corporate Investigations", Sept 1999
3. Eoghan Casey, "Handbook Computer Crime Investigation's Forensic Tools and Technology", Academic Press, 1st Edition, 2001
4. Skoudis. E., Perlman. R. Counter Hack: A Step-by-Step Guide to Computer Attacks and Effective Defenses.Prentice Hall Professional Technical Reference. 2001
5. Norbert Zaenglein, "Disk Detective: Secret You Must Know to Recover Information From a Computer", Paladin Press, 2000
6. Bill Nelson, Amelia Philips and Christopher Steuart, "Guide to computer forensics investigation "Course technology, 4th edition

Branch: MCA	Semester-V
Subject Code: 5123	Lecture: 04 Credit: 04
Subject Title	ELCTIVE II GEOGRAPHICAL INFORMATION SYSTEMS

Modules	Sr . No.	Topic Details	No. of Lectures Assigned	Marks Weightage
UNIT-I	1	**Fundamentals of GIS:** Defining GIS, components of GIS, spatial data, spatial data- maps, characteristics, spatial data modeling, attribute data management-database data model, GIS applications and developments in database.	8	16
UNIT-II	2	**Input-Output and Data Analysis in GIS:** Data input and editing– methods, editing, integration, Data analysis-measurements, queries, reclassification, buffering, map overlay, interpolation, analysis of surfaces, network analysis, spatial analysis, Analytical modeling in GIS - physical, environment and human processes, output from GIS –maps, non-cartographic output, spatial multimedia, decision support.	15	30
UNIT-III	3	**Issues in GIS:** Development of computer methods for spatial data, Issues in GIS–data quality and errors, sources of errors, human and organizational issues, GIS project design and management– problem identification, designing a data model, project management, Implementation, evaluation, the future of GIS, Internet	15	30
UNIT-IV	4	**Remote Sensing:** Principles of remote sensing, remote sensing system-classification, Imaging, characteristics, extraction of information from images–metric and thematic, Integration of RS and GIS.	8	16
	5	**Global Positioning Systems (GPS):** Introduction to GPS, Accuracy of GPS, Differential GPS, Applications of GPS, Integration of GIS and GPS.	4	08

Reference Books :

1. An Introduction to Geographical Information Systems by Heywood, Cornelius and Carver (Person Education Asia 2000)
2. Concepts and techniques of Geographic Information Systems by C. P. Lo and Albert Yeung (PHI, New Delhi)
3. Fundamentals of Geographic information Systems 2nd Edition by Michael N. Demers (John Wiley & Sons (ASIA) Pte Ltd)
5. ArcGIS Developer's Guide for Visual Basic Applications by Razvi (Onword Press, 2002)

Branch: MCA	Semester-V
Subject Code: 5124	Lecture: 04 Credit: 04
Subject Title	ELCTIVE II MULTIMEDIA APPLICATIONS

Module	Sr. No.	Detailed Content	Hours	Weightage
UNIT-I	1	Introduction to Multimedia What is multimedia, Hypermedia, Multimedia tools, Multimedia Authoring & its Tools, VERML, File Formats.	**5**	10
	2	Color in Images & Video Colour Models for Images & Videos, Video Signals, Digital Video, MIDI, Quantization, Transmission of Audio	**5**	10
UNIT-II	3	Compression Algorithms Lossless Compression , Introduction, Basics, RLC ,VLC, lossless Image Compression, Lossy Compression, introduction, Distortion, Rate Distortion Theory, Quantization	**5**	10
	4	Image Compression Standards JPEG standards, JPEG 2000 standards, JPEG –LS, standards, Bi-Level Image Compression Standards	**5**	10
	5	Video Compression Techniques Introduction, Motion Compensation ,Motion vectors, H.261& H.263,MPEG-1&MEPEG-2MPEG_4,MPEG-7,MPEG21	**5**	10
	6	Audio Compression ADPCM, Vocoders, Psychoacoustics, MPEG audio.	**5**	10
UNIT-III	7	Multimedia Network Applications Quality of Multimedia Data transmission, Multimedia over IP, Multimedia over ATM, Media on Demand, Multimedia over Wireless Network	**6**	10
	8	Multimedia Data bases Design and Architecture of Multimedia Data base, Types, Organization, Medias Abstraction, Query Language.	**7**	10
UNIT-IV	9	Frame Work for Multimedia Standards Introduction, Standard Activates, Standard to built a news Global Information Infrastructure, Standardization process on Multimedia Communication, ITU-I Mediacom 2004	**6**	10

		Framework, ISO/MPEG -21, Framework, IETF Multimedia Internet Standards.		
	10	Application layer: Introduction, ITU applications, MPEG Application , Digital Broadcasting Applications, Universal multimedia access.	**7**	**10**

Reference Books:

1. Fundamentals of Multimedia by Ze-Nian Li& Mark.S.Drew
2. Introduction to Multimedia Communication, Application, Middleware, Networking by K.R.Roa, Zoran S,Bojkovic & Dragorad A. Milovanovic.
3. Multimedia systems by Thakker

Branch: MCA	**Semester-V**
Subject Code: 5125	**Lecture: 04** **Credit: 04**
Subject Title	**Elective-II** **NURAL NETWORK AND FUZZY LOGIC**

Modules	**Sr. No:**	**Topics and Details**	**No.of Lectures/ Practicals assigned**	**Marks Weight age**
UNIT-I	1	Neural Networks Basics of Neural Networks: Introduction to Neural Networks, Biological Neural Networks, McCulloch Pitt model, Supervised Learning algorithms: Perceptron (Single Layer, Multi-layer), Linear separability, Delta learning rule, Back Propagation algorithm, Un-Supervised Learning algorithms: Hebbian Learning, Winner take all, Self-Organizing Maps, Learning Vector Quantization.	25	25
UNIT-II	2	Fuzzy Set Theory Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Properties of membership function, Fuzzy extension principle, Fuzzy Systems- fuzzification, defuzzification and fuzzy controllers.	20	20
	3	Hybrid system Introduction to Hybrid Systems, Adaptive	15	15

		Neuro Fuzzy Inference System(ANFIS).		
UNIT-III	4	Introduction to Optimization Techniques 5.1 Derivative based optimization- Steepest Descent, Newton method. 5.2 Derivative free optimization- Introduction to Evolutionary Concepts.	20	15
UNIT-IV	5	Genetic Algorithms and its applications: 6.1 Inheritance Operators, Cross over types, inversion and Deletion, Mutation Operator, Bit-wise Operators, Convergence of GA, Applications of GA.	20	25

Reference Books:

1. Timothy J.Ross "Fuzzy Logic With Engineering Applications" Wiley.
2. S.N.Sivanandam, S.N.Deepa "Principles of Soft Computing" Second Edition, Wiley Publication.
3. S.Rajasekaran and G.A.Vijayalakshmi Pai "Neural Networks, Fuzzy Logic and Genetic Algorithms" PHI Learning.
4. J.-S.R.Jang "Neuro-Fuzzy and Soft Computing" PHI 2003.
5. Jacek.M. Zurada "Introduction to Artificial Neural Sytems" Jaico Publishing House.
6. Satish Kumar "Neural Networks A Classroom Approach" Tata McGrawHill.
7. Zimmermann H.S "Fuzzy Set Theory and its Applications" Kluwer Academic Publishers.
8. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
9. Hagan, Demuth, Beale, "Neural Network Design" CENGAGE Le.

Branch: MCA	**Semester-V**
Subject Code: 5126	**Lecture: 04** **Credit: 04**
Subject Title	**Elective-II** **DESIGN TECHNIQUES AND DATA ANALYTICS**

Modules	**Sr. No:**	**Topics and Details**	**No.of Lectures/ Practicals assigned**	**Marks Weightage**
UNIT-I	1	INTRODUCTION TO BIG DATA Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.	10	20

	2	DATA ANALYSIS Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.	10	20
UNIT-II	3	MINING DATA STREAMS Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.	10	20
UNIT-III	4	FREQUENT ITEMSETS AND CLUSTERING Mining Frequent itemsets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K-Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.	10	20
UNIT-IV	5	FRAMEWORKS AND VISUALIZATION MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems – Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications:	10	20

REFERENCES BOOKS:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets,Cambridge University Press, 2012.
3. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics, John Wiley & sons, 2012.
4. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O" Reilly, 2011.
5. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.