SNDT Women's University

Syllabus

Masters

in

Computer Applications(MCA)

SNDT Women's University

Sir VithaldasThackerseyVidyavihar,

Juhu Road, Santacruz West, Mumbai 400 049.

(Applicable to students taking admission in and after 2019)

(SemI 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 MaharshiKarve 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: *SanskritaStreeParashakti*
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 ShreematiNathibaiDamodarThackersey (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 CouncilObjectives:

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 System Lab**	-	2	2	25	25	50
1202	**Data Structures Lab using C**	-	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 Cyber 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 Technologies 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 internalassessment and an external assessment for each course.

1. For each theory paper, 2credit will be based on internal assessmentand 2 credits for end examination (externalassessment), whereas the lab papers 1 creditis 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 oftheory 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 practicalexam & 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 theend 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. DuringDecember 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-SystemStructure,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	**Partial ordered sets (poset):**Hasse diagram, External elements of partially ordered sets Functions, Functions for computer science, Growth of functions, Permutation functions.	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:**	**TopicsandDetails**	**No.of lectures assigne**	**Marks Weightage**
UNIT-I	1	**Introduction:** Data types , ADT, data structure: Definition & classification Analysisofalgorithms(recursiveandnon-recursive)with emphasisonbest case,average caseandworstcase	4	10
UNIT-II	2	**LinearDatastructureswithapplications:** List:Introduction, implementationusingarray&linkedlist (singly, doubly,circular,multi-list), Applications: Polynomialrepresentation,Sparsematrix Stack:Introduction, implementationusingarray&linked list,Applications: Functioncall,Recursion, balancingof parenthesis,Polish Notation:infix topostfixconversionandevaluationofpostfixexpression Queue:Introduction (queue,circularqueue,deque,priority queue),implementationusing array&linkedlist, Applications:JobSchedulingF	12	25
UNIT-III	3	**NonLineardatastructures:** Tree: Introduction and representation, Forest, Tree traversal, Binary Tree (representation usingarrayandlinks):Binary treetraversal(recursive&non-recursive implementation),Expressiontree Graph:Introduction,representations,Traversal(BFS,DFS), Applications: Shortestpath(Singlesource-alldestinations), Minimalspanning tree(Prim'salgorithm,Kruskal'salgorithm)	12	25

UNIT-IV	4	**SearchingandSorting:** LinearSearch,Binary Search,Transposesequentialsearch, Binary searchtree,Heaptree(applicationinpriority queue andsorting),AVLtree,Splaytree,M-way searchtree,B tree(insertion),B+tree(Definitionandintroduction), B* tree(Definitionandintroduction), Tries,ApplicationofB treeandB+treeinFileStructures HashTables:Introduction, hashfunctionsandhashkeys, Collisions,Resolvingcollisions,Rehashing Sorting withalgorithmanalysis(bestcase,worstcase, average): Bubble, Selection, Insertion, Shell, Merge, Quick,Heap,Radix	14	30
	5	**NP-CompletenessandtheP&NPClasses** Introduction , Polynomial Time &Verification, NP-Completeness and Reducibility, The Vertex Cover Problem,TheTraveling SalesmanProblem,TheSet CoveringProblem	8	10

Reference Books:

1 MarkAllenWeiss,"DataStructuresandAlgorithmAnalysisinC",PearsonEducation, 2nd edition (2003)

2 G.A.V.PAI,"Datastructuresandalgorithms,concepts,TechniquesandApplications", 1st edition (2008)

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

4 Jean-PaulTremblay,PaulG.Sorenson,"AnIntroductiontoDataStructureswith Applications",TataMcGraw-Hill,2 Edition,(2007)

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

6 Gilberg&Forouzan,"DataStructures:APseudo-codeApproachwithC",Thomson Learning

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

8 Tanenbaum,"DataStructuresUsingC&C++",PHI.

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

10 AVAho,JEHopcroft,JDUllman,"DataStructures&Algorithms",Addison-WesleyPublishing(1983).

11 MichaelBerman,"DataStructuresViaC++:ObjectsbyEvolution",OxfordUniv.Press(2004)

12 DEKnuth,"Sorting&Searching-TheArtofComputerProgramming",Vol.3, Addison-WesleyPublishing(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 Protocols; Wavelength division Multiple access	14	25

		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 SYSTEM LAB**

Modules	**Sr. No:**	**Topics and Details**	**No: of lectures assigned**	**Marks Weightage %**
UNIT-I	1	**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 UNIX Toolbox Section, Regular Expressions, Combining Regular Expression Metacharacters	2	5
	2	**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	3	
UNIT-II	3	**Sed, the Streamlined Editor:** What Is sed? How Does sed Work? Addressing, Commands and Options, Error Messages and Exit Status, sed Scripting **The awkUtility:**awk as a UNIX Tool, What Is awk?,	5	20

		awk's Format, Formatting Output, awk Commands from Within a File, Records and Fields, Patterns and Actions, Regular Expressions, awk Commands in a Script File, **awk Programming Constructs:** Comparison Expressions, Variables, Redirection and Pipes Section, Pipes Section, Closing Files and Pipes, Review UNIX TOOLS LAB EXERCISE , Conditional Statements, Loops Section, Program Control Statements Section, Arrays Section, awk Built−In Functions, Built−In Arithmetic Functions, User−Defined Functions (nawk)		
UNIT-III	4	The Interactive Bourne Shell, The C Shell, The Korn Shell, The Interactive bash Shell	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. "Sed&Awk", 2nd Edition, Dale Dougherty and Arnold Robbins
3. "Introduction to Unix and Shell Programming", Pearson Education, M.G. Venkateshmurthy
4. Advanced Linux Programming, Mark Mitchell, Jeffrey Oldham, and Alex Samuel, New Riders Publishing
5. Unix/Linux Programming by SumitabhaDass, PHP

Subject Code: 1202	Practical: 02 Credit: 02
Subject Title	**DATA STRUCTURES USING C**

Modules	Sr. No:	Topics and Details	No: of hours assigned	Marks Weight age %
UNIT-I	1	Control Statement: Selection Statements, if , Nested if, The if-else-if, The ? alternative, The Conditional, Expression, switch, Nested switch, Iteration Statements- The for loop, . The while loop, The do-while loop,Jump Statements- The goto& label ,The break & continue, The exit() function	1	02
UNIT-II	2	Pointers: The basics of Pointer, The Pointer operator, Application of Pointer, Pointer Expression, Declaration of Pointer, Initializing Pointer, De-referencing, void Pointer, Pointer Arithmatic,Precedence of &, * operators, Pointer to Pointer, Constant Pointer, Array & String , Single Dimension Arrays, Accessing array elements, Initializing an array, Multidimensional Arrays, Intializing the arrays, Memory Representation, Accessing array elements, Passing Single Dimension array to Function.	2	12
	3	Array & Pointer , Array of Pointer , String Manipulation Functions, Function, Introduction, Arguments & local variables, Returning Function Results, Call by reference & Call by value, Recursion	4	
UNIT-III	4	Storage Classes: Automatic Storage Class, Extern Storage Class, Static Storage Class, Register Storage Class	2	12
	5	Structure ,Union, Enumeration &typedef: Structures, Declaration and Initializing Structure , Accessing Structure members, Structure Assignments, Arrays of Structure , Passing Structure to Function, Structure Pointer, Unions.	4	
UNIT-IV	6	File handling: Defining & Opening a File, Closing a File, Input/Output Operations on Files	4	24
	7	Error Handling During I/O, Operation, Random Access To Files, Command Line Arguments. Bitwise Operator: Bit Fields and simple arithmetic Operations	4	
	8	Graphics In C: Drawing Object in C, Line , Circle , Rectangle , Ellipse, Changing Foreground & Background, Filling Object by Color.	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	UNIFIED PROCESS AND USE CASE DIAGRAMS Introduction to OOAD with OO Basics – Unified Process – UML diagrams – Use Case –Case study – the Next Gen POS system, Inception -Use case Modelling – Relating Use cases – include, extend and generalization – When to use Use-cases	10	20
UNIT II	2	STATIC UML DIAGRAMS Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition – Relationship between sequence diagrams and use cases – When to use Class Diagrams	10	20
UNIT III	3	DYNAMIC AND IMPLEMENTATION UML DIAGRAMS Dynamic Diagrams – UML interaction diagrams – System sequence diagram – Collaboration diagram – When to use Communication Diagrams – State machine diagram and Modelling –When to use State Diagrams – Activity diagram – When to use activity diagrams Implementation Diagrams – UML package diagram – When to use package diagrams – Component and Deployment Diagrams – When to use Component and Deployment diagrams	10	20
UNIT IV	4	DESIGN PATTERNS GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioural – Strategy – observer –Applying GoF design	10	20

		patterns – Mapping design to code		
	5	TESTING Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans	**10**	**20**

REFERENCE BOOKS:

1. Craig Larman, ―Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development‖, Third Edition, Pearson Education, 2005.
2. Ali Bahrami – Object Oriented Systems Development – McGraw Hill International Edition – 1999
3. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, ―Design patterns: Elements of Reusable Object-Oriented Software‖, Addison-Wesley, 1995.
4. 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 SoftwareArchitecture • Models. • Processes. • Stakeholders.	**03**	**5**
	2	**1 Designing Architectures** • The Design Process. • ArchitecturalConception. • RefinedExperienceinAction:StylesandArchitectural Patterns. • Architectural Conception in Absence ofExperience.	**02**	**5**
UNIT II	**3**	**Connectors** • Connectors in Action: A MotivatingExample. • ConnectorFoundations. • ConnectorRoles. • Connector Types and Their VariationDimensions. • ExampleConnectors.	**06**	**15**

	4	**Modeling** • ModelingConcepts. • Ambiguity, Accuracy, andPrecision. • ComplexModeling:MixedContentandMultipleViews. • Evaluating ModelingTechniques. • Specific ModelingTechniques.	**04**	**10**
	5	**Analysis** • AnalysisGoals. • Scope ofAnalysis. • Architectural Concern beingAnalyzed. • Level of Formality of ArchitecturalModels. • Type of Analysis. • AnalysisTechniques.	**08**	**20**
UNIT III	**6**	**Implementation and Deployment** • Concepts. • ExistingFrameworks. • Software Architecture andDeployment. • Software Architecture andMobility.	**04**	**5**
	7	**Conventional Architectural styles** • Pipes andFilters • Event- based, ImplicitInvocation • Layeredsystems • Repositories • Interpreters • Processcontrol	**05**	**10**
	8	**Applied Architectures and Styles** • Distributed and NetworkedArchitectures. • Architectures for Network-BasedApplications. • DecentralizedArchitectures. • Service-Oriented Architectures and WebServices.	**08**	**15**
UNIT IV	**9**	**Designing for Non-Functional Properties** • Efficiency. • Complexity. • Scalability andHeterogeneity. • Adaptability. • Dependability.	**05**	**10**
	10	**Domain-Specific Software Engineering** • Domain-SpecificSoftwareEngineeringinaNutshell. • Domain-Specific SoftwareArchitecture. • DSSAs, Product Lines, and ArchitecturalStyles.	**05**	**5**

REFERENCE BOOKS:

1. "Software Architecture: Foundations, Theory, and Practice" by Richard N. Taylor, NenadMedvidovic, 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, 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	6	20
	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

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:**	**TopicsandDetails**	**No.of lectures assigned**	**Marks Weightage**
UNIT-I	1	Principles ofaccounting, Nature andscopeof accountingand financialmanagement,Double-Entrysystemofaccounting ,Introductiontobasicbooksofaccountsofsoleproprietary concern,Closingofbooksofaccounts.	4	8
	2	Preparationoftrialbalance,FinalAccounts,Trading,profit and loss accounts,BalanceSheets of sole proprietaryconcern withnormalclosingentries,Introduction tomanufacturing accounts,Finalaccountsofpartnership firmsandLimited companies, Controlaccountsfordebtorsandcreditors, Ratio Analysis,Meaning,advantages,Limitations, Typesofratios andtheirusefulness, Fundflowstatement,Meaning ofthe termfund:Flowof fund.	12	24

UNIT-II	3	Workingcapitalcycle,Preparationandinterpretation ofstatement, Costing,Nature,importance andbasic principles,Budgetandbudgetary control,Nature,scopeand Importance, Methodoffinalizationofmasterbudget Functionalbudget.	12	24
UNIT-III	4	Marginalcosting,Nature,scopeand Importance, Constructionofbreak-evenchart, Limitationsandusesof break-evenchart,Practical applicationsofmarginalcosting, StandardCosting,Natureandscopeofstandardcost	12	24
UNIT-IV	5	Variance,Varianceanalysiswithreferencetomaterial, labour,Overheadcosts, Interpretationofthevariance	10	20

References:

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:**	**TopicsandDetails**	**No.of lectures assigned**	**Marks Weightage**
UNIT-I	1	**StatisticalMethods:** Frequency distribution, measuresof central tendency,measures ofdispersion, linearcorrelation andregression, forecasting,Elementaryprobability theory,Bayestheorem, Somestandarddiscreteandcontinuousdistributions, Testing ofstatisticalhypothesesandtestsofsignificance, sampling distributions,non-parametric methods,Analysisofvariance	15	30
UNIT-II	2	**Optimizationmodels:** Introductionto optimisationmodels,Assignmentproblem,transportationproblems,Linearprogramming, Simplex method,sensitivity analysis,Useofrelevantpackages' Networkanalysis,PERT/CPM, resourceandscheduling, networkcompression andcostconsideration,useofrelevant packages	15	30
UNIT-III	3	**Inventorymodel** The classical economic order quantity, Sensitivity analysis,Non-zerolead-time	8	16

UNIT-IV	4	**Queuingmodel** Generalcharacteristics,Performancemeasure,Markovian queuingmodel,Non-Markovianqueuingmodel	12	24

Reference Books:

1. "PERTandCPMPrinciplesandApplication":Srinath
2. "OperationsResearch":Kantiswaroop,Gupta
3. "OperationsResearchMethodsandProblems":Sasieni,Yaspan Friedman
4. "MathematicalMethodsinOperationsResearch":Wagner
5. "OperationsResearch":Sharma
6. "OperationsResearch":Taha
7. "robabilityandstatisticalInference":R.V.Hogg&E.A.Tanis, Macmillan,1983
8. "IntroductoryMathematicalStatistics":E.KreyszigWiley,1970

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

To develop a mini-project following the 13 exercises listed below.

1. To develop a problem statement.
2. Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

Suggested domains for Mini-project: 1. Passport automation system. 2. Book bank 3. Exam Registration 4. Stock maintenance system. 5. Online course reservation system 6. E-ticketing 7. Software personnel management system 8. Credit card processing 9. e-book management system 10. Recruitment system 11. Foreign trading system 12. Conference Management System 13. BPO Management System.

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 assigned	Marks Weightage %
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	4	

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

SEMESTER III

Branch:MCA	Semester-III
SubjectCode:3101	Lecture:04 Credit:04
SubjectTitle	ADVANCEDJAVA

Modules	Sr. No.	TopicandDetails	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 toEventHandling –Identifyingthesourceof Event,EventListenersandEventHandlers,theDelegation Event Model, Eventclasses,EventListenerInterface, Action Listener interface, MouseListenerInterface Adapterclasses-theMouse Adapterclass,the MouseMotionListener Interface.	10	20
UNIT-II	3	Introduction to JDBC – What is JDBC. Database connectivity ,JDBCArchitecture,JDBCdrivers,Using JDBCAPI –LoadingaDriver,connectingandexecuting JDBCstatement,Handling SQL Exceptions.Accessing ResultSets,method ofResultSetinterface,Methods of PreparedStatementinterface,retrevingrow,insertingrow, Managing DatabaseTransactions,creatingandcalling storedproceduresinJDBC,usingMetadatainJDBC. JAVA Stream in JDBC, Stubs and drivers, JAR, WAR and EAR files	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 MethodInvocation,componentsofRMIapplication ,RMI architecture,RMI Packages,DistributedGarbage collection, Remoteinterface,creatingRMIserver, creatingRMIclient, clientside cabecks.	10	20

Reference Books:

1. 1. Java^{TM}2:TheCompleteReference,ThirdEdition,byPatrick NaughtonandHerbert Schildt,TataMcGrawHillEdition1999.
2. JavaEnterpriseinaNutshell:ADesktopQuickReference(NutshellHandbook)orany otherbookwithsimilarcontents.
3. MasteringJava2J2SE1.4byJohnZukouskiPBP Publication
4. JavaTMHowtoProgramSixthEditionbyH.MDeitel,P.J.Deitel
5. CoreServlets&JavaServerPages byMartyHall,LarryBrown
6. Spring Boot in Action 1st Edition by Craig Walls

Branch:MCA	Semester-III
SubjectCode:3102	Lecture:04 Credit:04
SubjectTitle	SOFTWARE ENGENEERING METHODOLOGY

Modules	Sr. No.	TopicandDetails	Noof Lectures Assigned	Marks Weightage
UNIT-I	1	Software Processes: Processes projects and products, Componentsoftwareprocesses, characteristics ofasoftware process, softwareDevelopmentProcess, project managementprocess,softwareconfiguration management process, software configuration management process, processmanagementprocess.	8	16
	2	SoftwarerequirementAnalysisandSpecification:Software requirement, needfor SRS,requirementprocess,problem analysis,analysis issues.Informalapproach,structured analysis,object oriented modeling, othermodeling approaches,prototyping, requirementspecification, characteristicsofanSRS, component ofanSRS, specificationlanguages,structureofrequirement document validationrequirementreviews,othermethodmetrics, sizemeasures,qualitymetrics.	8	16
UNIT-II	3	PlanningSoftwareProject:-Costestimation,uncertaintiesin costestimation,building costestimationmodels,onsize estimation,COCOMO model,projectscheduling,average durationestimation,projectscheduling andmilestones, staffing andpersonnel planning, rayleighcurve,personnel plan, team structure, software configurationmanagement plans,quality assuranceplans,verificationandvalidation, projectmonitoringplans, riskmanagement.	8	16
	4	Function Oriented Design:- Design principles, coupling, cohesion, design notation and specification, structured designmethodology, verification,networkmetrics,stability metrics,informationflowmetricsSoftwareTesting.	4	08
UNIT-III	5	TestingMethods:Softwaretestingfundamentals,testcase design, whiteboxtesting,controlstructuretesting,black-boxtesting,testingforspecializedenvironments. Software Testing Strategies: A Strategic Approach to software testing,strategic issues, unittesting,validation testing, systemtesting,theart of debugging.	8	16
	6	Re-Engineering : Software re-engineering, software maintenance,asoftwarereengineering processmodel, reverseengineering,reverseengineering userinterfaces, restructuring, coderestructuring, datarestructuring, forward engineeringtheeconomicsofreengineering.	8	16

UNIT-IV	7	Client/Server software Engineering: The structure of client/serversystems,softwareengineering forc/ssystems, analysismodeling issues,designforC/Ssystems,testing issues. Computer-Aided software Engineering: What is case,buildingblocksforcase,ataxonomy ofcasetools, integratedcaseenvironments,theintegrationarchitecture, thecaserepository	6	12

ReferenceBooks:

1. PresmanRoger,Software,Engineering:APractitioner'sApproachTataMcGrawHill,NewDelhi .
2. JalotePankaj,An IntegratedApproachtoSoftwareEngineeringNarosa,NewDelhi
3. R.E.Fairly.SoftwareEngineeringConcepts.McGrawHill,Inc1985.
4. Poyce,SoftwareProject Management,Addison-Wesly.
5. Sommerville,SoftwareEngineering,Addison-Wesly.

Branch:MCA	**Semester-III**
SubjectCode:3103	**Lecture:04** **Credit:04**
SubjectTitle	**COMPUTER NETWORK & PROGRAMMING**

Modules	**Sr. No:**	**TopicsandDetails**	**No:of lectures assigned**	**Marks Weightage**
UNIT-I	1	**Introduction to Networking** Introduction to computer network, network application, networksoftware 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. **NetworkHardware** Network Introduction,Network Interface Adapter-Function, Features,Selection ofNIC.CablingaNetwork–Cable properties, Standards, Types,cableinstallation.Network Interconnectiondevices:Repeaters, Hubs,Bridges,Routers, Switches,ServerTechnologies:Multipleprocessor server, Serverstoragetechnologies.DesigningaNetwork.	5	10

	2	**NetworkOperatingSystem:** a)Windows2000andWindowsNTOverview,Windows Networking Architecture, FileSystem, Windows NetworkingServices.WindowsNTDomains. b)NovellNetware:Netware roleinEnterprise, Netware Versions,Netwareinstallation,NetwareStorageSubsystem. c)Linux d)NetworkClients: WindowsNetworkClients,Netware Clients,UnixClients.	5	5
UNIT-II	3	**DirectoryServices:** a)ActivedirectoryservicesActivedirectoryarchitecture, Deploying active directory, designingactivedirectory, Managing, Activedirectory. b)Noveldirectoryservices:NDSarchitecture,NDStree design,BuildingthetreeNDSsecurity.	5	15
	4	**Installationof NOS** a)Installationofwindows2000/windowsNT b) InstallationofNovelletware c)Installationof Linux	5	10
UNIT-III	5	**Managingusersandgroups** Managing users and groups on windows, Linux and NetWare. ConfigurationofNetworkandcommunicationservices a)DHCPb)DNSc)WINES **Filesystem** a)NTFSanddistributedfilesystemonwin2000 b)NFS c)Sharingandsecuringfilesandfolders	5	10
	6	**NetworkServices** a)Webserve b)FtpServer c)E-mailerver d)TelnetServer	7	15
	7	**NetworkManagementandtroubleshootingtools** a)OperatingSystemutilities b)TCP/IPutilities, c)Networkanalyzer d)Trafficanalysis e)Protocolanalysis f)NetworkManagementUsingSNMP.	8	15
UNIT-IV	8	**Networkprogramming** UNIXNetworkingarchitecture,SocketsAPIinUNIX PreliminarysystemcallsforTCP/UDPsockets,I/Omodels inUNIX,SocketOptions,and AdvanceI/Osystemcalls. Broadcasting andMulticasting, RawSocketsand Data-link access, Remote Procedure Calls, Basic architectureforRPC,RPCruntimelibrary –highleveland low level calls. XDR (eXtended Data Representation) formatandXDRfilters.	10	20

ReferenceBooks:

1. ThecompleteReferenceNetworkingbyCraigZackerTMHPublication.
2. DistributedSystemsandNetworksbyWilliamBuchananTMHPublication.
3. Windows2000ServerBiblebyJeffreyR.SshapiroandJimBoyeeIDGBooks India.
4. UnixAdministrationHandbookEviNemeth,GarthSnyderPearsonEducation
5. The completereference Linux by Richard L. Peterson TataMcgrawHill Publication
6. IntroductiontoComputerNetworks-AndrewS.Tanenbaum
7. UNIXNetworkProgramming,VolumeIandII-W.RichardStevens
8. PowerProgrammingwithRPC-JohnBloomer
9. RPChandbook,JavaProgrammingLanguage-KenArnold,JamesGosling
10. JDK1.2Documentation
11. NetworkSecurityEssentials–WilliamStallings

Branch:MCA	**Semester-III**
Subject Code:3104	**Lecture:04** **Credit:04**
SubjectTitle	**RESEARCHMETHODOLOGY**

Modules	**Sr. No.**	**Topic andDetails**	**NoofLecturesAssigned**	**Marks Weightage**
UNIT-I	1	Research methodology: An Introduction ObjectivesofResearch, Types of Research, Research MethodsandMethodology, Defining a Research Problem,Techniquesinvolved in Defining aProblem.	4	08
	2	Research Design Need for Research Design, FeaturesofGood Design, Different Research Designs, BasicPrinciplesof Experimental Designs, Sampling Design, StepsinSampling Design, Types of Sampling Design,SamplingFundamentals, Estimation, Sample sizeDetermination,Randomsampling.	6	12
UNIT-II	3	Measurement and Scaling Techniques MeasurementinResearch, Measurement Scales, Sources in Error,Techniques of Developing Measurement Tools,Scaling,Meaning of Scale, Scale ConstructionTechniques.	10	20
	4	Methods of Data Collection and Analysis CollectionofPrimary and Secondary Data, Selection ofappropriatemethod Data Processing Operations, Elements ofAnalysis,Statistics in Research, Measures of Dispersion, Measures of	8	18

UNIT-III	5	Techniques of Hypotheses, Parametric or StandardTestsBasic concepts, Tests for Hypotheses I and II,Importantparameters limitations of the tests of Hypotheses,Chi-squareTest, Comparing Variance, As a non-parametric Test,Conversion of Chi to Phi, Caution in using	12	24
UNIT-IV	6	AnalysisofVarianceandCo-varianceANOVA,OnewayANOVA, Two Way ANOVA, ANOCOVA AssumptionsinANOCOVA, Multivariate Analysis TechniqueClassificationof Multivariate Analysis, factor Analysis, R-type QTypefactor Analysis, PathAnalysis	10	20

Reference books:

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

Branch:MCA	**Semester-III**
SubjectCode:3105	**Lecture:04** **Credit:04**
SubjectTitle	**CYBER SECURITY AND CYBER 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,	7	15

		Scanning, Security policy, Threat Management.		
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-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	8	15
UNIT-III	5	**Basic Concepts of Technology and Law:** Understandingthe Technology of Internet, Scope of Cyber Laws,CyberJurisprudence.	5	10
	6	**Law of Digital Contracts :** The Essence ofDigitalContracts, The System of Digital Signatures, The RoleandFunction of Certifying Authorities, The ScienceofCryptography, Intellectual Property Issues in Cyber,Space:Copyright in the Digital Media, Patents in the CyberWorld.	5	10
UNIT-IV	7	**Rights of etizens and E-Governance:** Privacy andFreedomIssues in the Cyber World, E-Governance, Cyber CrimesandCyber Laws, Ethical hacking. Information TechnologyAct2000: Information Technology Act-2000-(Sec 1 to94).	5	10
	8	**Cyber Law Issues for Management:** Cyber Law IssuesinE-Business Management, Major issues in CyberEvidenceManagement, Cyber Law CompliancyAudit.	4	10
	9	**INTELLECTUAL PROPERTYRIGHTS** **Basic Principles and Acquisition of IntellectualPropertyRights:** Philosophical Aspects of Intellectual PropertyLaws,Basic Principles of Patent Law, PatentApplicationprocedure, Drafting of a Patent Specification,UnderstandingCopyright Law, Basic Principles of Trade Mark,BasicPrinciples of Design Rights, International BackgroundofIntellectual Property Information TechnologyRelatedIntellectual PropertyRights.	4	10

Reference Books:

1. How to Register Your Own Copyright by Marx Warda, SphinxPublishing
2. Licensing Art & Design by Caryn R. Leland, AllworthPress
3. A Professional's Guide to Licensing and Royalty Agreements by Caryn R. LelandAllworthPressIT2000Bill
4. Web sites: online information,handouts

5. Digital Privacy and Security Using Windows: A Practical Guide By NihadHassan, 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**
SubjectCode:3201	**Practical:02** **Credit:02**
SubjectTitle	**ADVANCEDJAVALAB**

Modules	**Sr. No:**	**TopicsandDetails**	**No.of Lectures/ Practicals assigned**	**Marks Weightage**
UNIT-I	1	Class	2	04
	2	FunctionOverloading	4	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	JavaBeans	2	15
	8	Implementation of JTrees, JTable	2	
UNIT-IV	9	Remote Method Invocation	2	

Branch:MCA	**Semester-III**
SubjectCode:3202	**Lecture:04** **Credit:04**
SubjectTitle	**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 TimeServer
   ii. Implementation of Client-Server Communication UsingTCP.

iii. Implementation of TCP/IPECHO

2. Programs using UDP Sockets (like simpleDNS)
   i. Program using UDP Socket UDP ChatServer/Client
   ii. DNS Server to Resolve a given HostName
   iii. UDP DNSserver/client

3. Programs using Raw sockets (like packet capturing andfiltering)
   i. Packet Capturing andFiltering

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

5. Simulation of sliding windowprotocols
6. Experiments usingsimulators
   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 MACprotocols

8. Performance comparison of Routingprotocols

9. Study of TCP/UDPperformance
   i. Case Study 1: Study of UDPPerformance
   ii. Case Study 2: Study of TCPPerformance
   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,	10	20

		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-in Exceptions, Handling Exceptions, Exceptionwith 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**
SubjectTitle	**WEBTECHNOLOGY**

Modules	**Sr. No.**	**Topic andDetails**	**NoofLecturesAssigned**	**Marks Weightage**
UNIT-I	1	**General:** HTTP: Overview – HTTP Basics, Clientrequest,Server response; HTTP Headers; Session Management–Persistent connections, Cookies. General concepts onwebserver: Configuration & Administration; virtualhostingGeneral concepts of caching proxy server, Web securitySSL, Digital signatures;Authentication.	8	16
UNIT-II	2	**Client side technologies** HTML: Structure ofHTMLDocument – Meta tags, Links, Text, Lists, Tables,Inclusions(Objects, Images, applets andMultimediacontents);Presentation of HTML document – Style sheets,Alignment, fonts, frames; Interactive HTML document–Forms, Scripts. XML: Well-formed, Validdocument,Document Type Definitions and Document ObjectModelClient Side JavaScript: Object Reference – Objects.Methodsand Properties, Event Handlers; Language constructs–Statements andOperators.	12	24
UNIT-III	3	PERL &CGI CGI architecture Intro PERL with Features, WorkingwithStrings and Arrays, File Handling, Pattern matching&formatting, Creating and using subroutines, Using PERLforCGIscripting Java Servlets & JSP Active Server Pages:Overview,Request, Response, Applications, Sessions, Cookies,DataStore Access, Web Applications. SSI: SSI Directives;SSIEnvironment Variables; SSIFormats.	10	20

UNIT-IV	4	Apache TomcatServer Obtaining and Installing Apache Tomcat, TomcatDirectoryStructure - bin, conf, logs, server, work, temp, webapps,Web Application Directory Structure, Deploying HTMLandJSP Pages, Configuring Tomcat - Editingserver.xml,Deploying Web Applications - DeploymentDescriptors,web.xml configurationfile Tomcat Manager - Deploying and Managing Web Application using the Tomcat Manager, Creating aWARFile Configuring Tomcat to Connect to a DatabaseConfiguringSecurity on Tomcat, Granting Permissions to JavaApps	10	20
	5	Servlet vs CGI, Servlet APIOverview Servlet Life Cycle , Coding: Writing & runningsimpleservlet Generic servlet, HTTPServlet, ServletConfig,ServletContestWriting servlet to handle Get & Post methods, readinguserequest data , Session tracking in servlets, Servlets &JDBC.Writing threadsafeservlet	8	16
	6	Spring MVCArchitecture	2	4

References:

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

Branch:MCA	**Semester-IV**
SubjectCode:4103	**Lecture:04** **Credit:04**
SubjectTitle	**MANAGERIALECONOMICS**

Modules	**Sr. No.**	**TopicandDetails**	**Noof Lectures Assigned**	**Marks Weightage**
UNIT-I	1	Economicanalysis,Microeconomicsandmacroeconomics, Analysisof consumerbehavior:	6	12
	2	Law of demand and supply, Utility analysis/indifference curves, Revealedpreferencetheory, Elasticityofdemand, Consumersurplus.1.Breakevenpoint2.DemandForecasting	8	16
	3	TheFirm:Theoryofproduction:Productionfunction,ISO productcurves,Costanalysis,Optimumfirm	8	16

UNIT-II	4	Theoryofproductpricing:Revenueconcepts,Equilibriumof the firm&industryunderperfect Competition,monopoly, monopolisticcompetition,Oligopoly&duopoly	10	20
UNIT-III	5	TheoryofFactorypricing:Marginalproductivitytheoryof distributionand Moderntheory:Theoriesofrent,wages,interest&profit, Riskanduncertainly	10	20
UNIT-IV	6	Theeconomy: Nationalincome Concepts:.Savings–investments,ApplicationsofHarrod-DomarModel,Internationaltradeandbalanceof payments.	4	8
	7	Thefinancialsystem,Money:Definition and uses, Demand andsupplyofmoney,Commercialbankingsystems	4	8

REFERENCE BOOKS:

1. R.L.Varshney,KLMaheshwari"ManagerialEconomicsSultanChand&Sons
2. D.N.DWIVEDI"ManagerialEconomicsVikasPublication.
3. I.C.DHINGRA"EssentialofManagerialEconomicsSultanChand&SonsPublications
4. RUDDAR DATTK.P.M.SUNDRAM "Indian Economy" 54th edition S.Chand&CompanyLtd.

Branch:MCA	**Semester-**
SubjectCode:4104	**Lecture:04** **Credit:04**
SubjectTitle	**DATA WAREHOUSING AND DATA MINING**

Modules	**Sr No.**	**TopicDetails**	**No.ofLecturesAssigned**	**Marks Weightage**
UNIT-I	1	**DataWarehousing:** **Overview And Concepts:** Need for datawarehousing,Basic elements of data warehousing, Trends indatawarehousing.	2	08
	2	**Planning And Requirements:** Project planningandmanagement, Collecting therequirements.	2	
		Architecture And Infrastructure: Architecturalcomponents, Infrastructure	4	16
	3	**Data Design And Data Representation:** Principlesofdimensional modeling, Dimensional modelingadvancedtopics, data extraction, transformation and loading,dataquality.	4	

UNIT-II	4	**Information Access And Delivery:**Matchinginformation to classes of users, OLAP in datawarehouse,Data warehousing and theweb.	4	16
	5	**Implementation And Maintenance:** Physicaldesignprocess, data warehouse deployment, growthandmaintenance.	4	
	6	**DataMining:** **Introduction:** Basics of data mining, relatedconcepts,Data miningtechniques.	4	16
	7	**Data Mining Algorithms:** Classification,Clustering,Associationrules.	4	
UNIT-III	8	**Knowledge Discovery :** KDDProcess **Web Mining:** Web Content Mining, WebStructureMining, Web Usagemining.	6	24
	10	**Advanced Topics:** Spatial mining, Temporalmining.**Visualisation :** Data generalization andsummarization-based characterization, Analytical characterization:analysis of attribute relevance, Mining classcomparisons:Discriminating between	6	
UNIT-IV	11	**Data Mining Primitives, Languages, andSystemArchitectures:** Data mining primitives, Querylanguage,Designing GUI based on a data mining querylanguage,Architectures of data miningsystems	6	20
	12	**Application and Trends in Data Mining:**Applications,Systems products and research prototypes,Additionalthemes in data mining, Trends in	4	

REFERENCE BOOKS:

1. PaulrajPonnian, .Data Warehousing Fundamentals., JohnWiley.
2. M.H. Dunham, .Data Mining Introductory and Advanced Topics., PearsonEducation.
3. Han, Kamber, .Data Mining Concepts and Techniques., MorganKaufmann
4. Ralph Kimball, .The Data Warehouse Lifecycle toolkit., JohnWiley.
5. M Berry and G. Linoff, .Mastering Data Mining., JohnWiley.
6. W.H. Inmon, .Building the Data Warehouses., WileyDreamtech.
7. E.G. Mallach, .Decision Support and Data Warehouse systems.,TMH.

Branch:MCA	**Semester-IV**
SubjectCode:4201	**Practical:02** **Credit:02**
SubjectTitle	**PYTHON PROGRAMMING LAB**

Modules	Sr. No:	Topics andDetails	No.ofLectures/Practicalsassigned	MarksWeightage
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**
SubjectTitle	**WEBTECHNOLOGY LAB**

Modules	Sr. No.	Topic andDetails	NoofLecturesAssigned	MarksWeightage
UNIT-I	1	**General:** HTTP: Overview – HTTP Basics, Clientrequest,Server response; HTTP Headers; Session Management–Persistent connections, Cookies. General concepts onwebserver: Configuration & Administration; virtualhostingGeneral concepts of caching proxy server, Web securitySSL, Digital signatures;Authentication.	8	16
UNIT-II	2	**Client side technologies** HTML: Structure ofHTMLDocument – Meta tags, Links, Text, Lists, Tables,Inclusions(Objects, Images, applets andMultimediacontents);Presentation of HTML document – Style sheets,Alignment, fonts, frames; Interactive HTML document–Forms, Scripts. XML: Well-formed, Validdocument,Document Type Definitions and Document ObjectModelClient Side JavaScript: Object Reference – Objects.Methodsand Properties, Event Handlers; Language constructs–Statements andOperators.	12	24
UNIT-III	3	**PERL &CGI** CGI architecture Intro PERL with Features, WorkingwithStrings and Arrays, File Handling, Pattern matching&formatting, Creating and using subroutines, Using PERLforCGIscripting Java Servlets & JSP Active Server Pages:Overview,Request, Response, Applications, Sessions, Cookies,DataStore Access, Web Applications. SSI: SSI Directives;SSIEnvironment Variables; SSIFormats.	10	20
UNIT-IV	4	**Apache TomcatServer** Obtaining and Installing Apache Tomcat, TomcatDirectoryStructure - bin, conf, logs, server, work, temp, webapps,Web Application Directory Structure, Deploying HTMLandJSP Pages, Configuring Tomcat - Editingserver.xml,Deploying Web Applications - DeploymentDescriptors,web.xml configurationfile Tomcat Manager - Deploying and Managing Web Application using the Tomcat Manager, Creating aWARFile	10	20
	5	**Servlet vs CGI, Servlet APIOverview** Servlet Life Cycle , Coding: Writing & runningsimpleservlet Generic servlet, HTTPServlet, ServletConfig,ServletContestWriting servlet to handle Get & Post methods, readinguserequest data , Session tracking in servlets, Servlets &JDBC.Writing thread safeservlet		
	6	Spring MVCArchitecture		

Reference Books:

1. Beginning Web Programming with HTML, XHTML, CSS & JavaScript by

JonDuckett,Wrox.

2. Webmaster in a Nutshell by Stephen Spainhour, O'Reilly andAssociates.
3. JavaScript: The Definitive Guide by David Flanagan, O'Reilly andAssociates.
4. Beginning ASP 3.0 by David Buser and Others,Wrox.

Branch:MCA	**Semester-IV**
SubjectCode:4105	**Lecture:04** **Credit:04**
SubjectTitle	**ELECTIVE-I** **DATA SCIENCE**

Modules	**Sr. No.**	**TopicandDetails**	**Noof 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		

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, AnandRajaraman 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. ZakiandWagnerMiera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
8. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

Branch:MCA	Semester-IV
Subject Code:4105	Lecture:04 Credit:04
SubjectTitle	ElectiveI SOFTWARE TESTING AND TOOLS

Modules	Sr No.	TopicDetails	No.ofLecturesAssigned	MarksWeightage
UNIT-I	1	Software Testing Terminology and MethodologySoftware Testing Terminology, Software TestingLifeCycle, Writing a Policy for Software Testing,Economicsof Testing, Testing – An organizational Issue,Management Support for Software Testing, Fig.ofSoftware Testing Methodology, Risk associated withnotmeeting customer needs, Developing	4	14
	2	Overview of Software Testing Process AdvantagesofFollowing a Process, The Cost of Computer Testing,TheSeven-Step Software	3	
		Verification and Validation Verification andValidation(V&V) Activities, Verification, VerificationofRequirements, Verification of High –levelDesign,Verification of Low –level Design, How to Verify Code?	3	10
	3	Static Testing Inspections, Structured Walkthroughs,TechnicalReviews	2	
UNIT-II	4	Validation Activities Unit Validation Testing,IntegrationTesting, Function Testing, System Testing ,AcceptanceTesting	3	06
	5	Regression Testing Progressive vs. RegressiveTesting,Regression Testing Produces Quality Software,RegressionTestability, Objectives of Regression Testing, WhenisRegression Testing Done? , Regression TestingTypes,Defining Regression Test Problem, RegressionTestingTechniques	6	12
	6	Test Management Test Organization, Structure ofTestingGroup, Test Planning, Detailed Test Design andTestSpecifications	4	8

UNIT-III	**7**	Software Metrics Need for SoftwareManagement,Definition of Software Metrics, Classification ofSoftwareMetrics, Entities to be	4	8
	8	Testing Metrics for Monitoring and ControllingtheTesting Process Measurement Objectives forTesting,Attributes and Corresponding Metrics in SoftwareTesting,Attributes, Estimation Models for EstimatingTestingEfforts (include only topic Halstead Metrics), TestPointAnalysis (TPA) – introductiononly	5	10
UNIT-IV	**9**	Testing Process Maturity Models Need for TestProcessMaturity, Measurement and Improvement of aTestProcess, Test Process MaturityModels	4	8
	10	Automation and Testing Tools Need forAutomation,Categorization of Testing Tools, Selection ofTestingTools, Cost Incurred in Testing Tools, GuidelinesforAutomated Testing, Overview of SomeCommercialTesting Tools Testing Object Oriented SoftwareObject-OrientedTesting	6	12
	11	Using Agile Methods to Improve Software TestingTheimportance of Agility, Building an Agile TestingProcess,Agility Inhibitors, Is ImprovementNecessary,Compressing Time, Challenges, Solutions ,MeasuringReadiness , The Seven-Step Process 4.5 TestPlan	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,GopalaswamyRamesh,PearsonEd.
4. Software testing (2nd Edition) – By Ron Patton, PearsonEducation
5. Effective Software Testing 50 specific ways to improve your testing- By ElfriedeDustin,PearsonEdu.

Branch:MCA	Semester-IV
SubjectCode:4105	Lecture:04 Credit:04
SubjectTitle	Elective I COMPUTERGRAPHICS

Modules	Sr. No.	TopicandDetails	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,Raserandrandom scan displays,colourCRTmonitors, Flatpanaldisplays,LCDs. Designandarchitectureofraster scanandrandom scan display systems. Abriefintroductiontoinputdevicesnad hardcopy devices.Outputprimitives,DDAand Bresenham's2Dlinedrawing algorithms, Parallelline algorithms	8	16
UNIT-II	2	Midpointcircle generatingalgorithm,Ellipsegeneratingalgorithm, Othercurves,Filledareaprimitives, Scanline polygonfillalgorithm,Insideoutsidetest,Boundary fill algorithm,Floodfillalgorithm, Charactergeneration, Attributesofoutputprimitive, lineandcurveattributes, Characterattributes	10	20
UNIT-III	3	Anti-aliasing,Twodimensionalgeometrictransformations,Compositetransformations, GeneralComposite Transformations andComputationalEfficiency,Other transformations, Affinetransformation,Twodimensional viewing,Windowtoviewportcoordinatetransformation.	8	16
	4	Clippingoperations,CohenSutherlandlnieclipping,LiangBarskylineclipping,Nicholl-Lee-Nicholl lineclipping, polygon clipping,Sutherland HodgemanandWeiler Atherton Polygon clipping, Textandcurveclipping.Three dimensionalconcepts,Display methods,polygonsurfaces, quadricsurfacesandsuper quadrics.	12	24
UNIT-IV	5	Three dimensional Geometric and ModellingTransformations, General three dimensional rotation, Threedimensional viewing pipeline,Projections, Parallel andperspective projection, Viewvolume andgeneral Projectivetransformation. VisibleSurfaceDetection Methods, BackFacedetection,DepthBufferMethod,Abuffermethod,Depthsortingmethod.	12	24

ReferenceBooks: -

1. DonaldHearnandM.PaulineBaker,SecondEdition,PrenticeHallof India,1997.
2. J.D.Foley,AvanDam,S.K.Feiner,J.F.Hughes,AddisonWesleyPubl.Company,1997.
3. JimBlinn,JimBlinn'sCorner:AtripDowntheGraphicsPipeline,MorganKaufman,2000.

Branch:MCA	**Semester-IV**
SubjectCode:4105	**Lecture:04** **Credit:04**
SubjectTitle	**ELECTIVE-I** **ENTERPRISE RESOURCE PLANNING**

Modules	**Sr. No.**	**TopicandDetails**	**Noof 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 ofERP in Organization, Three-Tier Architecture of ERP system.	4	5
	2	**ERP and Implementation** ERP implementation and strategy, Implementation Life cycle, Preimplementation 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 ,DataMining, On- line Analytical Processing(OLAP), Product Life CycleManagement (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. JyotindraZaveri, 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
SubjectCode:5101	Lecture:04 Credit:04
SubjectTitle	MOBILEAPPLICATION DEVELOPMENT

Modules	Sr.No.	TopicandDetails	Noof 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 Animation	10	20
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 MartijnVerburg, 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**
SubjectCode:5102	**Lecture:4** **Credit:4**
SubjectTitle	**DECISION MAKING AND MATHEMATICAL MODELLING**

Modules	**Sr. No.**	**TopicandDetails**	**Noof 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 thEdition , 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 ZbigniewMichalewicz, 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**
SubjectCode:5103	**Lecture:04** **Credit:04**
SubjectTitle	**ARTIFICIALINTELLIGENCE**

Modules	**Sr. No.**	**TopicandDetails**	**Noof Lectures Assigned**	**Marks Weightage**
UNIT-I	1	**Introduction:** Overview of AI, Importance of AI,History, related fields, Representationof Knowledge,KnowledgeBaseSystems, StateSpaceSearch ProblemCharacteristicsof8-Queens, Traveling Salesman, Missionary &Cannibals, Crypt, Arithmetic, Monkey Banana Problem, Tower of HanoiandBlockWorld.	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:** RepresentingsimplefactsinLogic-Computablefunctionsinpredicates,resolution–unification –forwardvs. backwardreasoning.,Probabilisticreasoning–Bayes'sTheorem–Certainty Factors–Demphster–Shafer Theory–Fuzzy,Sets,Reasoning withFuzzyLogic,Natural	10	20
UNIT-III	4	**Structured Knowledge Representation:** AssociativeNetworks, SemanticNets,FramesStructures,Conceptual, Dependencies&Scripts,Learning –ConceptofLearning – Learning Automata,Learningbyinduction. **Natural Language Processing:** Overview of Linguistics,Grammars and Languages, basic Parsing techniques,semanticanalysis,andrepresentationstructures. Natural Language generation and Natural	12	24
UNIT-IV	5	**ExpertSystems:** Architecture–NeedandJustificationof ExpertSystems–Knowledge acquisitionandvalidation. Perception andAction,Realtimesearch,perception, action, vision,robotarchitecture,LearninginNeuralNetworks – Applications–HopfieldNetworks, Backpropagation , Case Study -XCON,PROSPECTOR	10	20

ReferenceBooks

1. IntroductiontoAIandExpertSystems-Patterson.
2. Artificial Intelligence A Modern Approach- Stuart Rushell
3. Artificial Intelligence-RichE andKnightK
4. PrinciplesofArtificial Intelligence-Nilsson.
5. Artificial Intelligence–AnEngineeringApproach-SchalkoffRJ
6. IntroductiontoExpertSystem-PeterJackson
7. Artificial Intelligence-Janakiraman

Branch:MCA	**Semester-V**
SubjectCode:5104	**Lecture:04** **Credit:04**
SubjectTitle	**SOFTWARE PROJECT MANAGEMENT**

Modules	**Sr. No.**	**TopicandDetails**	**Noof 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 projectcommunications plan, project metric, project control, designing thecontrol system, the plan-monitor-control cycle, data collectionand reporting, reporting performance and progress, informationdistribution.	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 andDetails**	**No.ofLectures/Practicalsassigned**	**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
Miniproject 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 andDetails**	**No.ofLectures/Practicalsassigned**	**Marks Weightage**
UNIT-I	1	**Introduction toAndroid** What is Android? Setting up development environment,Dalvik Virtual Machine & .apk fileextension,Fundamentals : a) Basic Building blocks– Activities,Services,Broadcast Receivers &Contentproviders b) UI Components- Views & notifications c)Components for communication -Intents	2	04
	2	**Application Structure(in detail)**AndroidManifest.xml, • uses-permission &uses-sdk • Activity/services/receiver declarations, Resources&R.java, Assets, Values – strings.xmlLayouts &Drawable Resources, Activities andActivitylifecycle, First sampleApplication,Deploying sample application on a realdevice	3	10
	3	**Emulator-Android Virtual Device:** Launchingemulator, Editing emulator settings, Emulatorshortcuts,Logcat usage, Introduction to DDMS, File explorer,	2	

UNIT-II	4	Second App :- (switching between activities), Developan app for demonstrating the communicationbetweenIntents **Basic UI design: ,**Form widgets, Text Fields, Layouts,•RelativeLayout ,TableLayout, FrameLayout,LinearLayout , Nested layouts, [dip,dp,sip,sp] versuspx**Preferences,** SharedPreferences, Preferences fromxml,Examples, **Menu** Option menu, Context menu,Submenu, 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 andTabActivity,** Examples, **Styles & Themes,**styles.xml,colors.xml- declaring colors and drawables,Drawableresources for shapes, gradients(selectors), •Shapesdrawables, •	4	16
		SQLite Programming: SQLiteProgramming,SQLiteOpenHelper, SQLiteDatabse,Cursor Content providers, • Defining and using contentproviders, • Example- Sharing database amongtwodifferent applications using content, providers,Readingand updating Contacts, Reading bookmarks, Example: - Develop an App to demonstrate database usage.CRUDoperations must be, implemented. Final details shouldbeviewed in GridView as well as in, ListView., Dothesame application with database operations in asingleclass(As a Model class) and do the CRUDoperationswith this classobject	5	10
UNIT-III	5	**Android Debug Bridge(adb)toolLinkify**Web URLs,Emailaddress,text,mapaddress,phone numbers, MatchFilter& ,ransformFilter,Examples **Adapters and Widgtes:** Adapters :-, a) ArrayAdapters, b) BaseAdapters, Example - Efficient Adapter ,ListViewand ListActivity, Custom listview, GridViewusingadapters, Gallery using adapters ,Examples **Notifications: ,**Broadcast Receivers , Services andnotifications, Toast,Alarms,Examples **Custom components :** Custom Toast, Customdialogs,Custom Tabs, Custom animated popup ,panels,Othercomponents,Examples	3	
UNIT IV	6	**Threads:** Threads running on UIthread(runOnUiThread), Worker thread, Handlers&Runnable, AsynTask(in detail),Examples	3	10
	7	**Advanced:** Live Folders, Using sdcards – Readingandwriting, XML Parsing, JSON Parsing, Includingexternallibraries in our application, Maps via	3	

Reference Books:

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

Branch:MCA	**Semester-V**
SubjectCode:5105	**Lecture:04** **Credit:04**
SubjectTitle	**ELCTIVE II** **IMAGE PROCESSING**

Modules	**Sr. No.**	**TopicandDetails**	**Noof 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	10
	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	15
	3	Image enhancement in spatial domain Point operations, Histogram Processing, SpatialFiltering, 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 homomorphicfiltering.	12	15
	5	Image Segmentation Detection of discontinuities, edge linking and Boundary detection, Hough Transform, thresholding region oriented segmentation.		
	6	Image representation and Description Boundary descriptors: shape number, Fourier descriptors, Statistical moments, Regional descriptors		
UNIT-III	7	Image data compression: Image data redundancies: coding, inter-pixel, psychovisual; Fundamentals of lossless compression: Arithmetic coding, Huffman coding, LZWcoding, RLE,Bit plane coding, predictive coding. Lossycompression: JPEG, Subbandcoding, Vector Quantization, Image compression Standards. Fidelity criteria.	12	10

UNIT-IV	8	Image morphology Morphological operation: Dilation erosion ,Opening & Closing, Hit or Miss Transform, Basic Morphological Algorithms	5	3

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**
SubjectCode:5105	**Lecture:04** **Credit:04**
SubjectTitle	**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
	02	**Initial Response and forensic duplication**	08	

UNIT-II		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.		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 procedure.	09	20
	04	**Network Forensics** 4.1 Intrusion detection; Different Attacks in network, analysis CollectingNetwork 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**
SubjectCode:5105	**Lecture:04** **Credit:04**
SubjectTitle	**ELCTIVE II** **GEOGRAPHICAL INFORMATION SYSTEMS**

Modules	**Sr. No.**	**TopicDetails**	**No.ofLecturesAssigned**	**MarksWeightage**
UNIT-I	**1**	**Fundamentals ofGIS:** Defining GIS, components of GIS, spatial data, spatialdata-maps, characteristics, spatial data modeling, attributedatamanagement-database data model, GIS applicationsanddevelopments indatabase.	8	16
UNIT-II	**2**	**Input-Output and Data Analysis inGIS:** Data input and editing– methods, editing, integration,Dataanalysis-measurements, queries, reclassification,buffering,map overlay, interpolation, analysis of surfaces,networkanalysis, spatial analysis, Analytical modeling in GIS-physical, environment and human processes, outputfromGIS –maps, non-cartographic output, spatialmultimedia,decisionsupport.	15	30

UNIT-III	**3**	**Issues inGIS:** Development of computer methods for spatial data, IssuesinGIS– dataqualityanderrors,sourcesoferrors,humanandorganizational issues, GIS project design andmanagement– problem identification, designing a data model,projectmanagement, Implementation, evaluation,	15	30
UNIT-IV	**4**	**RemoteSensing:** Principles of remote sensing, remote sensingsystem-classification, Imaging, characteristics, extractionofinformation from images–metric and thematic,Integrationof RS andGIS.	8	16
	5	**Global Positioning Systems(GPS):** Introduction to GPS, Accuracy of GPS, DifferentialGPS,Applications of GPS, Integration of	4	08

Reference Books:

1. An Introduction to Geographical Information Systems by Heywood, Cornelius andCarver(Person Education Asia2000)
2. Concepts and techniques of Geographic Information Systems by C. P. Lo and AlbertYeung(PHI, NewDelhi)
3. Fundamentals of Geographic information Systems 2nd Edition by Michael N. Demers(JohnWiley & Sons (ASIA) PteLtd)
5. ArcGIS Developer's Guide for Visual Basic Applications by Razvi (Onword Press,2002)

Branch:MCA	**Semester-V**
SubjectCode:5105	**Lecture:04** **Credit:04**
SubjectTitle	**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, FileFormats.	**5**	10
	2	Color in Images & Video Colour Models for Images & Videos, Video Signals, Digital Video, MIDI, Quantization, Transmission ofAudio	**5**	10
UNIT-II	3	Compression Algorithms Lossless Compression , Introduction, Basics, RLC,VLC, lossless Image Compression, LossyCompression, introduction, Distortion,	**5**	10

		RateDistortion Theory, Quantization		
	4	Image CompressionStandards JPEG standards, JPEG 2000 standards, JPEG –LS, standards, Bi-Level Image Compression Standards	**5**	10
	5	VideoCompressionTechniques Introduction, Motion Compensation ,Motionvectors, H.261& H.263,MPEG-1&MEPEG-2MPEG_4,MPEG-7,MPEG21	**5**	10
	6	AudioCompression ADPCM, Vocoders, Psychoacoustics, MPEG audio.	**5**	10
	7	Multimedia Network Applications Quality of Multimedia Data transmission, Multimediaover IP, Multimedia over ATM, Media on Demand, Multimedia over Wireless Network	**6**	10
UNIT-III	8	Multimedia Data bases Design and Architecture of Multimedia Data base, Types, Organization, Medias Abstraction, QueryLanguage.	**7**	10
	9	Frame Work for MultimediaStandards Introduction, Standard Activates, Standard to built anews Global Information Infrastructure, Standardizationprocess on Multimedia Communication, ITU-IMediacom 2004 Framework, ISO/MPEG -21, Framework, IETF Multimedia Internet Standards.	**6**	10
UNIT-IV	10	Application layer: Introduction, ITU applications, MPEG Application , Digital Broadcasting Applications, Universalmultimedia 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: 5104	**Lecture: 04** **Credit: 04**
Subject Title	**Elective-II** **NURAL NETWORK AND FUZZY LOGIC**

Modules	Sr. No:	Topics andDetails	No.ofLectures/Practicalsassigned	MarksWeightage
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 Neuro Fuzzy Inference System(ANFIS).	15	15
UNIT-III	4	Introduction to Optimization Techniques 5.1 Derivative based optimization- Steepest Descent, Newton	20	15

		method. 5.2 Derivative free optimization- Introduction to Evolutionary Concepts.		
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.VijayalakshmiPai "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: 5104	**Lecture: 04** **Credit: 04**
Subject Title	**Elective-II** **DESIGN TECHNIQUES AND DATA ANALYTICS**

Modules	**Sr. No:**	**Topics andDetails**	**No.ofLectures/Practicalsassigned**	**Marks Weightage**
	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

UNIT-I	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 UNIT-III	3	MININGDATA 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
	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. AnandRajaraman and Jeffrey David Ullman, Mining of Massive Datasets,Cambridge University Press, 2012.
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