

SHRI JAGDISHPRASAD JHABARMAL TIBREWALA UNIVERSITY

JHUNJHUNU (RAJASTHAN)



INSTITUTE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SCHEME AND DETAILED SYLLABUS

FOR

MCA (MASTER OF COMPUTER APPLICATION)

EFFECTIVE FROM ACADEMIC SESSION 2020 – 2021

ELIGIBILITY OF THE CANDIDATES

Passed BCA / Bachelor Degree in Computer Science Engineering or equivalent Degree

OR

Passed B.Sc./ B.Com./ B.A. with Mathematics at 10+2 level or at Graduation Level (with additional bridge courses as per the norms of the concerned university)

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying examination

Bridge Course

1. Bridge Course [For students other than BCA / B.Sc. (CS/IT)]

It will be an audit course for Non Computer Graduates. No Marks will be added. But Student has to pass this Course; in order have basic knowledge of Computer Science.

2. Guidelines for Evaluation of Bridge Course

As per norms of AICTE APH 2020-21, students except BCA / B.Sc. (CS/IT) have to qualify a Bridge Course as per University norms.

- a. Bridge course shall be an Audit Course whose award shall not be considered for overall MCA Course credit and percentage. However, the grades will be reflected in the mark sheet of the student.
- b. Institutes/Colleges have to arrange classes as per SJJTU syllabus at their own level.
- c. The examination for the bridge course will be conducted by University before the End term Examination (Both Odd and Even Semester) on the dates prescribed by the University.
- d. Preferably the result of the bridge course should be declared before the End Term Examination.
- e. The students have to clear the Bridge Course before the End Term Examination of third semester.
- f. For a Pass, candidate must obtain at least grade E for each theory and practical.

3. Theory Question Paper pattern for Bridge Course Exam

Maximum Marks =100

- a. Part-A will contain 10 questions, covering full syllabus of 2 marks each .Word limit for answer is 25 words.
- b. Part-B will contain 5 questions (1from each unit) of 4 marks each. Word limit is 100 words.

- c. Part-C will contain 3 out of 5 questions of 20 marks each. Questions will be based on Design/ Problem Solving skills.

4. Practical Question Paper pattern for Bridge Course Exam

Maximum Marks =100

- a. Practical question paper will contain 4 practical questions of 15 marks each.
 b. Practical Record will be of 20 marks.
 c. Viva voce will be of 20 marks.

SODECA (Anandam): Social Outreach, Discipline & Extra Curriculum Activities

Guidelines for SODECA [Anandam]

Maximum Marks 100; Credits: 08

The following activities are categorized as SODECA [Anandam]:

S. No.	Activities	Maximum Marks
1	<p>Discipline</p> <p>The marks shall be deducted from this component for those who shall involve themselves in indiscipline/ undesirable activities/ Detained from departments or in case of penalty of marks imposed by University Authorities, such deduction should be preferably approved by Head of the Department.</p>	20
2	<p>Games and Sports / Field Based Activities</p> <p>Sports Activities or any other field related activity.</p>	20
3	<p>Cultural/ Literary Activities/ Social Outreach / Personality Development Based Activities</p> <p>Activities such as Celebration of recognized National Days/ Birth Anniversary of great personalities, Hostel Day/ Annual Day/ Fresher's Day or any other related activity. Contribution towards social up-gradation based activities, Activities by social organization like, Art of Living, Yoga etc., Blood donation, Awareness programs, personality development programs, activities under different clubs (if not covered under above heads) like, photography etc., NGO activities, Plantation/ cleanliness activities etc.</p>	20

4	Academic/Technical/ Professional Development Activities Attending workshops, seminars, FDPs for reasonable duration/numbers. Attending/ paper presentation in conferences.	20
5	Anandam Program Activities The students are expected to perform the following activities: ❖ Do at least one act of individual service each day ❖ Record this act of service in a dedicated Register/Personal Diary (PD) ❖ Participate in a sharing and presentation on the group service in the discussion session held once a month	20
Total Marks		100

BRIDGE COURSE

S. No.	Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks		
			L	T	P		Internal/Min. Pass Marks	External/Min. Pass Marks	Total/Min. Pass Marks
Theory									
1	MCA-B01	Fundamentals of Computer Science	3	1	-	3	30/12	70/28	100/40
2	MCA-B02	Mathematical Foundations in Computer Science	3	1	-	3	30/12	70/28	100/40
Practical's									
3	MCA-B03	C Programming & MS Office Lab	-	-	2	3	40/16	60/24	100/40
Total			9	3	2				400
Total Teaching Load			14						

L= Lecture, **T**=Tutorial, **P** = Practical

Year: I**Semester: I**

S. No.	Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks			Credit
			L	T	P		Internal/Min. Pass Marks	External/Min. Pass Marks	Total/Min. Pass Marks	
Theory										
1	MCA-101	Database Management Systems	3	1	-	3	30/12	70/28	100/40	3
2	MCA-102	Operating Systems	3	1	-	3	30/12	70/28	100/40	3
3	MCA-103	Web Technologies	3	1	-	3	30/12	70/28	100/40	3
4	MCA-104	Software Engineering	3	1	-	3	30/12	70/28	100/40	3
5	MCA-105	Programming in JAVA	3	1	-	3	30/12	70/28	100/40	3
6	MCA-106	Computer Architecture	3	1	-	3	30/12	70/28	100/40	3
Practical's										
7	MCA-107	SQL-PL/SQL Lab	-	-	2	3	40/16	60/24	100/40	1
8	MCA-108	Web Technologies Lab	-	-	2	3	40/16	60/24	100/40	1
9	MCA-109	Linux Programming Lab	-	-	2	3	40/16	60/24	100/40	1
		SODECA								2
Total			18	6	6				900	
Total Teaching Load			30							23

L= Lecture, T=Tutorial, P = Practical

Year: I**Semester: II**

S. No.	Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks			Credit
			L	T	P		Internal/Min. Pass Marks	External/Min. Pass Marks	Total/Min. Pass Marks	
Theory										
1	MCA-201	Advance JAVA	3	1	-	3	30/12	70/28	100/40	3
2	MCA-202	Programming through Python	3	1	-	3	30/12	70/28	100/40	3
3	MCA-203	PHP	3	1	-	3	30/12	70/28	100/40	3
4	MCA-204	Data Structures and Algorithm Design	3	1	-	3	30/12	70/28	100/40	3
5	MCA-205	E-Commerce	3	1	-	3	30/12	70/28	100/40	3
6	MCA-206	Data Communication and Networking	3	1	-	3	30/12	70/28	100/40	3
Practical's										
7	MCA-207	Advance JAVA Programming Lab	-	-	2	3	40/16	60/24	100/40	1
8	MCA-208	Python Programming Lab	-	-	2	3	40/16	60/24	100/40	1
9	MCA-209	Data Structures and Algorithm Design Lab	-	-	2	3	40/16	60/24	100/40	1
		SODECA								2
Total			18	6	6				900	
Total Teaching Load			30							23

L= Lecture, T=Tutorial, P = Practical

Note:

Mandatory Summer Training: 45 Working Days Summer Training during Semester Break, of 100 Marks. Evaluation will be done in Semester-III Examinations.

Year: II**Semester: III**

S. No.	Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks			Credit
			L	T	P		Internal/Min. Pass Marks	External/Min. Pass Marks	Total/Min. Pass Marks	
Theory										
1	MCA-301	Android Application Development	3	1	-	3	30/12	70/28	100/40	3
2	MCA-302	Data Mining and Warehousing	3	1	-	3	30/12	70/28	100/40	3
3	MCA-303	Cloud Computing	3	1	-	3	30/12	70/28	100/40	3
4	MCA-304	Artificial Intelligence	3	1	-	3	30/12	70/28	100/40	3
5	MCA-305	Elective -I	3	1	-	3	30/12	70/28	100/40	3
6	MCA-306	Elective -II	3	1	-	3	30/12	70/28	100/40	3
Practical's										
7	MCA-307	Android Application Development Lab	-	-	2	3	40/16	60/24	100/40	1
8	MCA-308	Data Mining And Warehousing Lab	-	-	2	3	40/16	60/24	100/40	1
9	MCA-309	Summer Industrial Training Presentation	-	-	2	3	40/16	60/24	100/40	1
		SODECA								2
Total			18	6	6				900	
Total Teaching Load			30							23

L= Lecture, T=Tutorial, P = Practical

Elective -I:

- a) Software Testing and Quality Assurance
- b) Application Development Using .NET Framework

Elective -II:

- a) System Administration
- b) ERP Systems

S. No.	Code	Subject Name	Hrs./Week			Exam Hrs.	Maximum & Minimum Marks			Credit
			L	T	P		Internal/Min. Pass Marks	External/Min. Pass Marks	Total/Min. Pass Marks	
Theory										
1	MCA-401	Software Project Management	3	1	-	3	30/12	70/28	100/40	3
2	MCA-402	Elective-III	3	1	-	3	30/12	70/28	100/40	3
Practical's										
3	MCA-403	Industrial Project	-	-	2	3	40/16	60/24	100/40	6
		SODECA								2
Total			6	2	2				300	
Total Teaching Load			10							14

L= Lecture, **T**=Tutorial, **P** = Practical

Note: The industrial project is part of the curriculum will be held in the institute as one of the laboratories. This may be in continuations to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level).

The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by SJJTU.

Elective-III:

- a) Principles of Management and Information System
- b) Machine Learning
- c) Data Science with R

MCA-B01 Fundamentals of Computer Science

Unit	Contents
I	<p>Introduction to Computers: Characteristics of computers, Evolution of computers, generation of computers, classification of computers, applications of computers. Input and Output Devices and CPU. Primary and Secondary Memory. Number Systems. Computer Software: types of softwares.</p>
II	<p>Operating System: Introduction of operating system, types of operating system, functions of an operating system, modern operating systems.</p> <p>Data Communication and Computer Network: Introduction, data communication, transmission media, multiplexing, switching, computer network, network topologies, communication protocols, network devices.</p> <p>Internet Basics: Introduction, evolution of Internet, basic Internet terms, getting connected to Internet, Internet applications, electronic mail and other Internet Services, searching the web (search engines), languages of Internet, viruses. Use of Anti-Virus software.</p>
III	<p>Problem Solving with C Programming History, Execution of C Program, Constants, Variables and Keywords, Data types, Expressions, constants, variables, Operators, Operator Precedence and associativity, data input and output, Formatted Console I/O Functions, Conversion Specifications, assignment statements, conditional statements, Looping Statements, Storage Classes</p>
IV	<p>Array and Modular Programming Introduction to Function, Functions with Simple Output Parameters, Passing Values between Functions, Multiple Calls to a Function, Parameter Passing by Value v/s Parameter Passing by Reference, Recursion Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Multidimensional Arrays, Passing arrays as arguments</p>
V	<p>Structures , Unions , Strings and Pointers Structures & Unions- definition, Processing structures – Passing structures to a function. Pointers: Operations on Pointers – Pointers to Functions, Functions Returning Pointers, Arrays of pointers. String handling</p>
<p>Text Books:</p> <ul style="list-style-type: none"> • Peter Norton, “ Introduction to Computers”, 6th Edition, 2009. • Yashvant Kanetkar, “Let Us C”, BPB Publications, 13th edition, 2012. • S Prasad, K.R Venugopal, “Mastering C”, Tata McGraw Hill, 2006. • E.Balaguruswamy, “Programming in ANSI C”, Tata McGraw Hill, 6th edition, 2012. <p>Reference Books:</p> <ul style="list-style-type: none"> • Pradeep K Sinha ,PritiSinha, “Computer Fundamentals”, 6th Edition, 2003. • Bayron Gottfried, “Schaum’s Outline of Programming with C”, 4th Edition, 2018. • Kernighan and Ritchie, “The C Programming Language”, Prentice Hall, 2015. 	

MCA-B02 Mathematical Foundations in Computer Science

Unit	Contents
I	<p>Matrices: Introduction, Rank of Matrix, Solving System of Equations, Inverse of a Matrix, Set theory, Principle of inclusion and exclusion, partitions, Permutation and Combination, Relations, Properties of relations, Matrices of relations, Closure operations on relations, Functions- injective, subjective and objective functions.</p>
II	<p>Probability: Probability Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence problems. Introduction to Statistics- Population, Sample, Variable, Descriptive Statistics-Mean, Mode, Median, Measures of Spread- Range, Inter Quartile Range, Variance, Standard Deviation.</p>
III	<p>Propositions & Propositional Calculus: Propositions and logical operators, Truth table, Propositions generated by a set, Equivalence and implication, Basic laws, Functionally complete set of connectives, Normal forms, Proofs in Propositional calculus, Predicate calculus.</p>
IV	<p>Data Representation: Data Representation - Floating point Arithmetic – Addition, Subtraction, Multiplication and Division operation. Pitfall of floating point representation, Errors in numerical computation Iterative Methods, Measurement of Accuracy by using Absolute Error and Relative Error.</p>
V	<p>Graphs & Trees: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Spanning Trees.</p>
<p>Text Books:</p> <ul style="list-style-type: none"> • Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 7th Edition, 2017. • Seymour Lipschutz, Marc Laras Lipson, Varsha H. Patil, "Discrete Mathematics (Schaum's Outlines) (SIE)", Revised 3rd Edition, 2017 • Murray Spiegel John Schiller, R. AluSrinivasan, DebasreeGoswami, "Probability and Statistics", 3rd Edition, 2017 • Salaria, R.S.: "Computer Oriented Numerical Methods", Khanna Book Publishing Co. (P.) Ltd., New Delhi. 5th Edition, 2012 <p>Reference Books:</p> <ul style="list-style-type: none"> • A.Tamilarasi&A.M.Natarajan, "Theory of Automata and Formal Languages", New Age International Pvt. Ltd Publishers, 2008. • David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011. • Edgar Goodaire, "Discrete Mathematics with Graph Theory" Pearson Education • Bernard Kolman. Robert Busby. Sharon C. Ross, "Discrete Mathematical Structures (Classic Version), 6th Edition", Pearson Education 	

MCA-B03 C Programming & MS Office Lab

Contents
Simple C Programs to Learn <ul style="list-style-type: none">• Data types & Expressions, Constants & Variables• Operators, Operator Precedence and associativity• Keywords & Identifiers• Storage Classes• Conditional statements• Looping Statements
Array and Modular Programming <ul style="list-style-type: none">• Basic Array programs using for loop• User defined functions• Recursion• Programs on Two dimensional Arrays , Passing arrays as arguments
String handling <ul style="list-style-type: none">• Programs based on String Functions and Character Operation• Programs based on an array of Pointers to Strings
Structure and Pointers <ul style="list-style-type: none">• Programs based on Structures & Unions• Programs based on pointers (arithmetic operations on Pointer, arrays with pointers).• Programs of Pointers to structures and Array of structures
MS Office <ul style="list-style-type: none">• Practical based of advanced features of Word processing, Spread Sheet, data processing, presentation program, web surfing and other internet services.

MCA-101 Database Management Systems

Unit	Contents
I	Introduction: Overview of DBMS, Advantages of DBMS, Basic DBMS terminology, Database System v/s File System, Data Independence, Architecture of DBMS, Introduction to data models: Relational Model, Network Model, Hierarchical Model, Entity-Relationship Model.
II	Data modeling using the Entity Relationship Model: ER model concepts, Types of Relationships, notation for ER diagram, Reduction of ER-Diagrams to Relational Model, mapping constraints, Generalization, Aggregation, Specialization, Extended ER model, relationships of higher degree.
III	Relational model: Storage Organizations for Relations, Relational Algebra, Set Operations, Relational Calculus, Concepts of Alternate key, Candidate key, Primary key, Foreign key, Integrity Rules, Data Dictionary.
IV	Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design. Transactions: Transaction Concept, State, ACID properties, basic understanding of Concurrency & Recovery.
V	Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands: DDL, DML, TCL, DCL, SQL operators, Tables, Views and Indexes, Constraints, Group By and Having Clause, Order By Clause, Queries and sub queries, Aggregate Functions, Numeric Functions, String Functions, Date & Time Functions, Insert, Update and Delete operations, Unions, Intersection, Minus, Joins: Equi-Join, Natural Join, Self-Join, Inner Join, Outer Join
<p>Text Books:</p> <ul style="list-style-type: none"> • Elmasri, Navathe, “Fundamentals of Database Systems”, Addison Wesley, 7th Edition, 2016. • Korth, Silberschatz, Sudarshan, “Database Concepts”, McGraw Hill, 6th Edition, 2010. <p>Reference Books:</p> <ul style="list-style-type: none"> • Thomas Connolly and Carolyn Begg, “Database Systems: A Practical Approach to Design, Implementation, and Management, Addison Wesley, 6th Edition, 2014. • Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill, 3rd Edition, Jan 2007 • Date C J, “An Introduction to Database System”, Addison Wesley, 8th Edition 2003 • Bipin C. Desai, “An Introduction to Database Systems”, Galgotia Publication, Revised Edition, 2010 • Majumdar & Bhattacharya, “Database Management System”, TMH, 2005. • Paul Beynon Davies, “Database Systems”, Palgrave Macmillan, 3rd Edition, 2003 	

MCA-102 Operating Systems

Unit	Contents
I	Introduction to Operating System & Process Management: Definition and types of operating systems, Operating system components and services, System calls. Process and Thread Management: Process concept, Process scheduling, operations on processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and evaluation.
II	Memory Management: Swapping, Contiguous Allocation, Paging, Segmentation with paging virtual Memory, Demand paging , Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery.
III	Concurrency Control: The Critical-Section problem, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Dining philosopher and producer consumer problem using semaphores or monitors. Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Banker's Algorithm.
IV	Disk Management: Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, Disk scheduling methods, Disk management, Swap-Space management. Protection and Security-Goals of protection. UNIX/LINUX Operating System: Introduction, Features of UNIX/LINUX operating system, Structure: Kernel and Shell, Basic commands, Accessing help options, Filenames and using wild cards, Types of files, File systems: four block of file systems, directory hierarchy, Operations and utilities for directory and files. User & Group file access permissions.
V	Shell Programming: Introduction to vi and Emacs editor. Basic of shell programming, meta characters, shell variable: predefined variables and user defined variable, storing value in variable and accessing it, unsetting variables, storing filenames, content and command in variable, Input: reading word by word, line by line and from file, Expression, Decisions and repetition, Special parameters and variables, shell programming in bash, read command, conditional and looping statements, case statements, changing positional parameters and argument validation, string manipulation. Simple filter commands – pr, head, tail, cut, paste, sort, uniq, tr, Regular expressions: atoms and operators, grep.

Text Books:

- Silberschatz and Galvin, “Operating System Concepts”, 10th edition, Wiley India, 2018.
- Andrew S. Tanenbaum, Albert S. Woodhull, “Operating Systems Design & implementation”, 3rd edition, Pearson Education, 2006.
- Sumitabha Das, “UNIX – Concepts & Applications”, Tata McGraw Hill Publications, 4th edition, 2006.
- Graham Glass & King Ables, “Linux for programmers and users”, Pearson Education India, 3rd edition, 2006.

Reference Books:

- William Stallings, “Operating Systems Internals and Design Principles”, 5th edition, Prentice Hall, 2000.
- Fadi P. Deek, James A. M. McHugh, “Open Source Technology and Policy”, Cambridge University Press, 1st edition, 2008.
- Forouzan B. A., Gilberg R. R., “UNIX and Shell Programming”, TMH, 2nd edition, 2008.

MCA-103 Web Technologies

Unit	Contents
I	HTML: Internet standards, WWW Architecture, Generation of dynamic web pages, Generation of static webpages using HTML, Elements of HTML syntax, Head and Body sections, Building HTML documents, Inserting text, images, hyperlinks, Backgrounds and Color Control, meta tags, ordered and unordered lists, Table Handling: Table layout & presentation, constructing tables in a web page, Frames: Developing Web pages using frames, IFrames. Forms and its elements, special tags.
II	Cascading Style Sheet (CSS): Introduction to CSS, Basic syntax and structure, Inline Styles, Embedding Style Sheets, Linking External Style Sheets, Backgrounds, Manipulating text, Margins and Padding, Border, Positioning using CSS, Selectors, Tag selectors, class selectors, ID Selector, Styling Groups within tags, Formatting Tables and Forms, CSS3 Specific Properties: Alpha Color Space, Opacity, Box Shadow & Border Radius.
III	JavaScript: JavaScript Variables and Data Types, Statement and Operators, Control Structure, Functions, Executing deferred scripts, Objects, Messaging in a JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Events Handlers, Forms, Forms array, Forms Handling and Validations.
IV	Ajax and jQuery: Introduction to Ajax, Cross-Browser DOM, Advantages and Disadvantages, Ajax the jQuery way: using load, post, get functions, jQuery: jQuery Basics, Selecting Element with jQuery, Managing Events, Hiding and Showing Elements, Toggling visibility using jQuery.
V	WordPress: Introduction & install, setup and publish websites using the core functionality of the WordPress platform, Content Management using WordPress, customize themes, build e-commerce shops, and implement basic SEO into your WordPress website.
<p>Text Books:</p> <ul style="list-style-type: none"> • Harvey & Paul Deitel& Associates, Harvey Deitel and Abbey Deitel, “Internet and World Wide • Web - How To Program”, Fifth Edition, Pearson Education, 2011. • Achyut S Godbole and AtulKahate, “Web Technologies”, Second Edition, Tata McGraw Hill, 2012. • Anthony T. Holdener III, Ajax: The Definitive Guide, O’Reilly Media, First edition, 2008. • Brad Williams, Hal Stern, and David Damstra, “Professional WordPress: Design and Development” <p>Reference Books:</p> <ul style="list-style-type: none"> • Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013. • David Flanagan, “JavaScript: The Definitive Guide, Sixth Edition”, O’Reilly Media, 2011 • David Sawyer McFarland, CSS3- The Missing Manual, O’Reilly Media, Third Edition, 2013 	

MCA-104 Software Engineering

Unit	Contents
I	Introduction to Software and Software Engineering Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Agile Process Model, Component-Based Development.
II	Software Project Requirement Analysis and Specification: Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning, Project Scheduling & Tracking, Basic idea of behavioral modeling in UML. State diagrams, Interaction diagrams, Use case diagrams. Understanding the Requirement, Requirement Modeling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation.
III	Project Planning & Scheduling: Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, Risk Identification and Projection: Project scheduling and Tracking. Object oriented concepts and principles. Software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management.
IV	Software Design & Quality Management: Design Concepts and Design Principal, Design Documentation, Design Methods: Data Design, Architectural Design, Interface Design, Component Level Design, User Interface Design, Web Application Design. Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances.
V	Software Testing: Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging. Software Maintenance and Configuration Management: Types of Software Maintenance, Reengineering, Reverse Engineering, Forward Engineering, The SCM Process, Identification of Objects in the Software Configuration, Risk-Related Monitoring.
Text Books: <ul style="list-style-type: none"> • Roger S Pressman, Bruce R Maxim, “Software Engineering: A Practitioner’s Approach”, 8th edition, Tata McGraw Hill, 2014. • Ian Sommerville, “Software engineering”, 9th edition, Addison Wesley Longman, 2014. • James Rumbaugh. MichealBlaha, “Object oriented Modeling and Design with UML”, 2nd Edition, 2007. Reference Books: <ul style="list-style-type: none"> • Simon Bennett, Steve McRobb and Ray Farmer, “ Object-Oriented Systems Analysis and Design Using UML” 4th Edition, McGraw Hill Education, 2010 • Charles Ritcher, “Designing Flexible Object Oriented systems with UML”, Tech Media, 2008. • Grady Booch, James Rumbaugh, IvarJacobson., “The Unified Modeling Language User Guide”, 2nd Edition, Pearson, 2007. 	

MCA-105 Programming in JAVA

Unit	Contents
I	Introduction to Java and OOPS, Java Tokens- Comments, Identifiers, Keywords, Separators. Working with Java Editor Softwares – Editplus, NetBeans and Eclipse. Packages with static imports. Working with jar. Modifiers – File level, Access level and Non-access level. Datatypes, Literals, Variables, Type Conversion, Casting and Promotion, Reading runtime values from keyboard and Properties File.
II	Operators and Control Statements, Method and Types of methods, Variable and Types of Variables, Constructor and Types of constructors, Block and Types of Blocks, Declarations, Invocations and Executions, Compiler and JVM Architecture, Static Members and their execution control flow. Non-Static Members and their execution control flow, Final Variables and their rules.
III	Classes and Types of classes, OOPS- Fundamentals, Models, Relations and Principles, Coupling and Cohesion (MVC and LCRP Architectures), Types of objects and Garbage Collection, Arrays and Var-arg types, Enum and Annotation, Design Patterns
IV	API and API Documentation, Fundamental Classes – Object, Class, System, Runtime, String Handling, Exception Handling and Assertions, Multithreading with JVM Architecture, IO Streams (File IO), Networking (Socket Programming)
V	Wrapper Classes with Auto boxing and unboxing, Collections with Generics. Inner classes, AWT, Swings, Applet, Regular Expressions, Formatting date, time
<p>Text Books:</p> <ul style="list-style-type: none"> • Herbert Schildt, “Java: The Complete Reference”, 11th Edition, McGraw-Hill, 2019. • E. Balagurusamy, “Programming with Java: A Primer”, 6th Edition, Tata McGraw-Hill, 2019. <p>Reference Books:</p> <ul style="list-style-type: none"> • Bruce Eckel, “Thinking in Java”, 4th Edition, Prentice Hall, 2006. • Cay S. Horstmann, “Core Java, Volume I: Fundamentals”, 9th Edition, Pearson Education, 2014. 	

MCA-106 Computer Architecture

Unit	Contents
I	Logic gates, basic combinational logic, Boolean function & Expressions, multiplexer, decoders, encoder, comparators, adder and substructures, BCD to 7 segment decoder, sequential circuits, RS, JK, D and T flip flops, counter and shift register, Clock and timing events.
II	Addressing methods and machine program sequencing memory location addresses, encoding of information, instructions types, Instruction format and instruction sequencing addressing modes, paging, relative, indirect and indexed addressing. Basic of computer organizations: System buses and instruction cycles, memory subsystem organization and interfacing, I/O subsystem organization and interfacing, Register transfer languages.
III	CPU design: Specifying a CPU, design and implementation of a simple CPU (fetching instructions from memory decoding and executing instructions, establishing required data path, design of ALU, Number representation, Arithmetic operations, floating point arithmetic. Design of the control unit and design verification), design and implementation of a simple micro-sequencer.
IV	Memory organization: Main memory concepts, Auxiliary memory, Associate memory, virtual memory & paging and caching memory organization.
V	Input and output organization: Asynchronous data transfer, programmed I/O Interrupts (types, processing of interrupts implementing interrupts inside CPU) direct memory access, I/O processor, serial communication.
<p>Text Books:</p> <ul style="list-style-type: none"> • John D. Carpinelli, “Computer Systems Organization and Architecture”, 3rd edition, 2008 • M. Morris Mano, “Computer Systems Architectures”, PHI, 3rd edition, 2008 • Albert Paul Malvino, “Digital computer electronics”, 3rd edition, TMHL <p>Reference Books:</p> <ul style="list-style-type: none"> • John P. Hayes, “Computer Organization and Architecture”, McGraw -Hill • V. Carl. Hamacher, “Computer Organization”, McGraw-Hill 	

MCA-107 SQL-PL/SQL Lab

Contents
1. SQL data types, Operators, Literals, Constraints
2. Assignment on Queries: Select / From / Where/ Group By/Having Clause/ Order By Clause/ SQL Operators/ Joins/ Built-in Functions
3. PL/SQL Block Structure
4. Conditional Statements
5. Iterations: Simple Loops, For Loop, While Loop, Nested Loops
6. Exception Handling
7. Database Programming with Record Variables
8. Database Programming with Cursors, Cursor-For Loop
9. Functions: Aggregate / Numeric / String / Date & Time / Logical
10. Joins: Equi-Join / Natural Join / Self Join / Inner Join / Outer Join
11. Unions / Intersection / Minus
12. Subqueries or Nested Queries
13. Cursor
14. Triggers
15. Packages

MCA-108 Web Technologies Lab

Contents
HTML: <ul style="list-style-type: none">• Basics Elements & Attributes, HTML Formatting tags, Links,• Images, Tables, Forms Elements• HTML5 Audio and Video, HTML5 Input Types & Attributes• CSS Syntax, CSS Attribute Selectors• CSS properties: Fonts, Background, Colors, Links, Lists,• CSS Box Model, Display, Opacity, Float, Clear• CSS Layout, CSS Navigation Bar,• CSS Rounded Corners, CSS Border Images, CSS Animations
JavaScript: <ul style="list-style-type: none">• Displaying Output, Declaring Variables, Operators, Arithmetic, Data Types, Assignment• JavaScript Functions, Booleans, Comparisons, Conditional ,• JavaScript Switch, Loops, Break, Type,• JavaScript Objects, Scope,• Strings and String Methods• Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods• JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,• JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM
WordPress: <ul style="list-style-type: none">• Installing WordPress• Designing websites using WordPress

MCA-109 Linux Programming Lab

Contents

Compilation and Execution of C Programs through Linux/UNIX

Shell Programs:

1. Implementation of Shell Programming Concepts:

- Shell programming in bash
- Shell Variables Input concepts
- Expression
- Decisions and repetition
- Special parameters and variables
- Command line arguments
- Case statements
- Changing positional parameters and argument validation
- String manipulation
- File Operations
- Base conversion

2. User defined functions.

Administration:

1. Installing Linux through bootable media/ through NFS
2. Creating & Managing User Accounts
3. Creating & Managing Groups.

MCA-201 Advance JAVA

Unit	Contents
I	JDBC, JDBC API and JDBC Drivers, JDBC API, SQL Establishing Connection to Database, Statement interface, Prepared Statement interface, Result set Interface SQL 99 Data types, Metadata, Callable Statement, Batch updates, Transaction Management, Connection Pooling, Row Set, Communicating with difference databases, JDBC 4.0 Features, Working With Properties File.
II	SERVLET, JEE Introduction, Servlet API, HTTP Protocol, Developing Servlet, Developing And Deploying Servlet Apps in Diff Servers, ServletRequest, ServletResponse, ServletConfig, GenericServlet, Working with welcome-file Methods of loading Servlet, ServletContext, HttpServlet, HttpServletRequest, HttpServletResponse, RequestDispatching, Redirecting, Attributes.
III	State and Session Management, URL Rewriting, Hidden form fields, Cookies, HttpSession, Error Handling in Servlet, Filters, Listeners
IV	Authentication and Authorization (Security In Servlet Programming), Working Connection Pooling, Working with domains, Working with Servlet 2.5/3.0/3.1 features, Annotations in Servlet Programming.
V	JSP Introduction, JSP Basics, JSP Tags, Scripting Elements, JSP implicit object, Directives, Standard Actions, Java Bean, Using Java Bean in JSP, Expression Language, Working JSTL, Custom Tags, MVC Architecture, Developing Project using MVC
<p>Text Books:</p> <ul style="list-style-type: none"> • Bryan Basham, Kathy Sierra & Bert Bates , “Head First Servlets and JSP” Paperback, 2008 • James Keogh, J2EE: The complete Reference <p>Reference Books:</p> <ul style="list-style-type: none"> • Marty Hall and Larry-Brown,”Core servlets and Java server pages: volume 1:Core Technologies”, pearson education, USA, 2008. • Santosh Kumar K, “JDBC, Servlet, and JSP: Black Book”, Kogent Solutions Inc., 2008. 	

MCA-202 Programming through Python

Unit	Contents
I	Introduction and overview Introduction to Python, Origin, Comparison, Comments, Operators, Variables, Classes, Modules Syntax and Style Statements, Variable Assignment, Identifiers, Basic Style Guidelines, Memory Management
II	Python Objects Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types. Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions. Sequences: Strings, Lists, and Tuples, Sequences, Strings, Strings and Operators, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings
III	Lists and Dictionaries Operators, Built-in Functions, List Type Built-in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, Conditionals and Loops: if statement, else Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement.
IV	Files, Regular Expression and Exception Handling File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules. Regular Expression: Introduction/Motivation, Special Symbols and Characters for REs, REs and Python. What Are Exceptions? Exceptions in Python, Detecting and Handling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions.
V	Database Interaction SQL Database connection using python, creating and searching tables, Reading and storing config information on database, Programming using database connections, Python Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading.
<p>Text Books:</p> <ul style="list-style-type: none"> • Core Python Programming, R. Nageswara Rao, Dreamtech Press, Second Edition, 2018 • Python Programming, Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, Notion Press, First Edition, 2020 • The Complete Reference Python, Martin C. Brown, McGraw Hill Education, Fourth Edition, 2018 <p>Reference Books:</p> <ul style="list-style-type: none"> • Think Python, Allen B. Downey, O'Reilly Media, 2016 • Programming and Problem Solving with Python, Amit Ashok Kamthane, Ashok Namdev Kamthane, McGraw Hill HED, First Edition, 2017 • Advanced Python Programming, Sakis Kasampalis, Quan Nguyen, Dr Gabriele Lanaro, Ingram short title, 2019 	

MCA-203 PHP

Unit	Contents
I	Introduction of web applications. Introduction to web designing with HTML and Cascaded Style Sheets. Concept of Client-Side Scripting and Server-Side Scripting. Static website vs Dynamic website development. Web Servers: Local Servers and Remote Servers.
II	Introduction to PHP, Installing Web servers, PHP configuration in IIS & Apache Web server. Data types in PHP, Variables, Constants, operators and Expressions. PHP Operator: Conditional Structure - if, switch case & Looping Structure - for, while, do while, foreach.
III	Introduction to Arrays: Initialization of an array, Iterating through an array, Sorting arrays, Array Functions, Functions: Defining and Calling Functions, Passing by Value and passing By references, Inbuilt Functions: String Function, Math Function, Date Function and Miscellaneous Function.
IV	Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP, Maintaining User State: Cookies, Sessions and Application State. Working with Files: Opening and Closing Files, Reading and Writing to Files, Getting Information on Files.
V	PHP Database Connectivity: Introduction to MYSQL, Creating database and other operations on database, connecting to a database, Use a particular database, Sending query to database, Parsing of the query results, Checking data errors.
<p>Text Books:</p> <ul style="list-style-type: none"> • Steven Holzner, “The Complete Reference - PHP”, Tata McGraw Hill, 2008 • Tim Converse, Joyce Park “PHP Bible”, 2nd Edition • Dave W. Mercer, Allan Kent, Steven D. Nowicki, David Mercer, Dan Squier, Wankyu Choi with HeowEide-Goodman, Ed Lecky-Thompson, Clark Morgan “Beginning PHP5” <p>Reference Books:</p> <ul style="list-style-type: none"> • PHP and MySQL Web Development (Developer's Library) 5th Edition, Luke Welling Laura Thomson, 2016 • Mike McGrath, “PHP & MySQL in easy Steps”, Tata McGraw Hill, 2012. • David Sklar and Adam Trachtenberg, PHP Cookbook, Third Edition, O’Reilly Media, 2014. 	

MCA-204 Data Structures and Algorithm Design

Unit	Contents
I	Introduction - algorithm definition and specification – Design of Algorithms, and Analysis of Algorithms, Asymptotic Notations. Linked lists – Searching, Insertion, Deletion, Sorted Linked List, Circular List, Two wayList.
II	Stacks – Array representation & Implementation, Operations on Stacks: Push & Pop, Linked representation of stack, Conversion of infix to prefix and postfix expressions, Evaluation of postfix expression using stack, Queues - Array and linked representation and implementation, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Searching: Linear and Binary Search Methods Sorting: Bubble Sort, Selection Sort, Insertion Sort
III	Trees: Binary tree, Terminology & Representation, Binary Search Trees (BST)-Insertion and Deletion Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Elementary Graph algorithms, Representation of Graphs, BFS, DFS. Divide and Conquer Method: Merge Sort, Quick Sort
IV	The Greedy Method:- Knapsack Problem, Minimum Cost Spanning Tree, Single Source Shortest Path Dynamic Programming: Multistage Graphs, All Pair Shortest Path, Optimal Binary Search Trees , 0/1 Knapsack Problem, Traveling Salesman Problem
V	Backtracking:- general method – 8-Queens Problem, Sum of Subsets, Hamiltonian Cycles Branch and Bound :- The Method– Knapsack Problem
<p>Text Books:</p> <ul style="list-style-type: none"> • AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012. • Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Course Private Limited, 2012. • Thomas H Coremen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, “Introduction to Algorithms”, Mc-Graw Hill, 2006 • D.S Malik, “Data Structures using C++”, Cengage Learning, 2nd edition, 2009 • Tannenbaum, “Data Structure Using C”, Pearson Education, 2019. <p>Reference Books:</p> <ul style="list-style-type: none"> • Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education,2009. • Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008. • E. Horowitz &Sahni, “Fundamental Data Structure”, Galgotia Book Source, 1983. 	

MCA-205 E-Commerce

Unit	Contents
I	<p>Business Environment and Dependence on IT Introduction to Business Informatics, Organizational Structure and Design, Dependence on Technology, Integrating Technology with Business Environment, IT and Corporate Strategy, Sustaining a Competitive Edge through application of IT in Management Functions.</p>
II	<p>E-Commerce Definition, Objectives, Components, Advantages and disadvantages, Scope, E-Commerce Models, E-Commerce Opportunities for Industries, Growth of E-Commerce, e-Commerce Applications- E-Marketing, E-Customer Relationship Management, E-Supply Chain Management, E-Governance, E-Buying, E-Selling, E-Banking, E-Retailing.</p>
III	<p>E-Payments and Security issues in E-Commerce Introductions, Special features, Types of E-Payment Systems (EFT, E-Cash, E-Cheque, Credit/Debit Card, Smart Card, Digital Tokens and Electronic Purses/ Wallets), Security risk of E-Commerce, Types of threats, Security Tools, Cyber Laws, Business Ethics</p>
IV	<p>ERP Introduction, Needs and Evolution of ERP Systems, ERP Domain, ERP Benefits, ERP and Related Technologies, Relevance to Data Warehousing and Data Mining, ERP Drivers, Evaluation Criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement Phases, ERP Units, ERP Success & Failure Factors</p>
V	<p>Information Systems Introduction, Categories of System: Open, Closed, Physical, Abstract, Dynamic, Static etc., Types of Information Systems: TPS, MIS, DSS, OLAP, OLTP, Expert System, Internet Based Systems, Learning Management Systems, Business Process Re-Engineering.</p>
<p>Text Books:</p> <ul style="list-style-type: none"> • Ravi Kalakota, “Electronic Commerce: A Manager's Guide”, Addison-Wesley Professional, Edition 2012. • Henry C. Lucas, Information Technology for Management, McGraw Hill, International Edition, July 2001. • Kenneth C. Laudon& Jane P. Laudon, Management Information System, Global Edition, Pearson Education, 2009. • ERP: A Managerial Perspective Book Description, Sadagopan S, Tata McGraw Hill, 2013 <p>Reference Books:</p> <ul style="list-style-type: none"> • Dr. K Abirami Devi & Dr. M Alagammai, “E-Commerce Essentials”, Margham Publication, 2012. • Kenneth C. Laudon, Karol Traver, “E-Commerce 2014”, Prentice Hall Publication, 2013. • Enterprise Resource Planning Systems System, Lifecycle, Electronic Commerce and Risk by Daniel E.O. Leary, 2011 • WamanJawadekar, Management Information System: Text and Cases, Tata McGraw Hill, June 2009. 	

MCA-206 Data Communication and Networking

Unit	Contents
I	<p>Overview of Data Communication and Networks: Basic concept, Data Transmission modes, Signals; Modulation - Principles of Modulation, AM and FM Modulator Circuits, Pulse Code Modulation, signaling and decoding. Digital Band-pass Modulation. Demodulation - detection, signals and Noise, Detection of Binary Signal in Gaussian Noise, Demodulation of shaped Pulses, Digital Band Pass Demodulation.</p> <p>Network Models : Internet model, OSI seven layer network model, Functions of OSI layers, LAN technologies - protocols and standards, LAN hardware, TCP/IP (Protocols, architecture, layers, services).</p>
II	<p>Data transmission: Data Communication Systems, DTE-DCE Interface, Modems, Transmission media (Guided & Unguided). Multiplexing - FDM, WDM, TDM, Digital Subscriber Line (Operation, Layers, Traffic control), FTTC, Error detection and correction; Microwave- Electromagnetic spectrum, Characteristics, use of MIW in communications; PM Microwave Radio Repeaters. Satellite - Artificial Satellite, Geosynchronous Satellites, Orbital classification, Spacing and Frequency allocation, Multiple accessing.</p> <p>Optical fiber communication: Basic concept of light propagation, Fiber Cables, Light sources, Optical Detectors, Fiber cable losses, wave division multiplexing, fiber distributed data interface, the fiber channel.</p>
III	<p>Networking and Internetworking Devices: Repeaters, Bridges, switches, Routers, Gateways and roles of these devices in communication.</p> <p>Data link layer: Multiple Access and LAN Technologies: Random Access, ALOHA, CSMA, CSMA/CD, CSMA/CA, Ethernet, IEEE Standards, IEEE802.11:Architecture, MAC Sublayer. Wireless LANs, Broadband Wireless, Bluetooth, Bridges.</p> <p>Network Layer: Routing: Broadcast, Multicast, Routing for Mobile Hosts, AdHoc Networks; Congestion; Quality of Service. IP Addressing: Network layer level protocols: IPv4, IPv6.</p>
IV	<p>Internet: Internet Architecture, Internet protocol and datagram, Routing protocols, UDP, Internet standard services, DNS. Networking Technologies, ISDN (Services, Channels, Layers, Broadband ISDN), Cable Modem System, SMDS, Frame relay, fast Ethernet, 100VG-anyLAN and Gigabit Ethernet, FDDI and CDDI, Asynchronous Transfer, SONET (architecture, layers, frame, applications), DWDM Switching and Virtual LAN, Non-ATM Virtual LANs, IEEE 802.1Q VLAN standard, X.25 protocols, ATM (architecture, layers, classes, services).</p>
V	<p>Network Performance, Analytical approaches, simulation, traffic monitoring. Network Management - SNMP, RMON and RMONv2, TMN, Directory services and network management. Issues related to network reliability and security, SSL and VPN, Introduction only to firewalls and Kerberos, Cyber Laws.</p>
<p>Text Books:</p> <ul style="list-style-type: none"> • Forouzan, B.A, 2009, Data Communications and Networking, 4th Edition, Tata McGraw Hill Education. • Tanenbaum, A.S , 2010, Computer Networks, 3rd Edition, Pearson Education. • Douglas E. Comer, Internet Working with TCP/IP Volume –I, Fifth Edition, Prentice Hall, 2008. • W. Richard Stevens, Bill Fenner and Andrew M. Rudoff, Unix Network Programming, Vol.1: The Sockets Networking API, Third Edition, Addison-Wesley Professional, 2003. 	

MCA-207 Advance JAVA Programming Lab

Sr. No.	Contents
1	Simple java applications for understanding references to an instant of a class
2	Handling strings in JAVA
3	Package creation
4	Developing user defined packages in java
5	Use of Interfaces
6	Threads, Multithreading
7	Exception Handling
8	Dynamic HTML using Servlet
9	Use of get() and Post() methods
10	Cookies in Servlet
11	Session tracking and Management
12	JDBC
13	JSP Actions elements
14	Directives elements in JSP
15	JSP Tags
16	Implement JDBC with JSP
17	Implement JDBC with Servlet

MCA-208 Python Programming Lab

Sr. No.	Contents
1	Installation of Python, and learning interactively at command prompt and writing simple programs.
2	Learning the conditions and iterations in Python by writing and running simple programs.
3	Random number generations, and problems based on random numbers.
4	Handling tuples and exercises based on tuples.
5	Functions and files
6	Linear and binary search
7	Handling tokens
8	Finding unique, and duplicate items of a list.
9	Matrix addition, multiplications, and unity matrix.
10	Text processing using python
11	Programs related to python libraries like Numpy, Pandas, Scipy etc.

MCA-209 Data Structures and Algorithm Design Lab

Sr. No.	Contents
1	Linear search & binary search , Sorting Techniques
2	Stacks and queues operations (with arrays and pointers)
3	Link List and Trees operations (with arrays and pointers)
4	graphs – basic traversal and search techniques
5	Greedy method:-knapsack problem
6	Greedy method minimum cost spanning tree
7	Dynamic Programming – 0/1 Knapsack
8	Dynamic Programming – traveling salesman problem
9	Backtracking 8-Queens problem
10	Backtracking Sum of Subsets
11	Branch and Bound -0/1 Knapsack problem
12	Sequential and Dynamic Implementations

MCA-301 Android Application Development

Unit	Contents
I	<p>Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools</p> <p>Android application components: Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes.</p> <p>Android Application Lifecycle: Activities, Activity lifecycle, activity states, monitoring state changes</p>
II	<p>Android User Interface: Measurements – Device and pixel density independent measuring units. Layouts – Linear, Relative, Grid and Table Layouts. User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers.</p> <p>Event Handling – Handling clicks or changes of various UI components.</p> <p>Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities</p>
III	<p>Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS.</p> <p>Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity.</p> <p>Notifications – Creating and Displaying notifications, Displaying Toasts.</p>
IV	<p>Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference.</p> <p>Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update).</p>
V	<p>Advanced Topics: Alarms – Creating and using alarms.</p> <p>Using Internet Resources – Connecting to internet resource, using download manager.</p> <p>Location Based Services – Finding Current Location and showing location on the Map, updating location.</p>
<p>Text Books:</p> <ul style="list-style-type: none"> • Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012 • Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013 <p>Reference Books:</p> <ul style="list-style-type: none"> • Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013 	

MCA-302 Data Mining and Warehousing

Unit	Contents
I	<p>INTRODUCTION TO DATA MINING: Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System With A Database or Data Warehouse System, Major Issues In Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity.</p> <p>PREPROCESSING: Data Quality, Major Tasks in Data Preprocessing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration.</p>
II	<p>DATA WAREHOUSING AND ON-LINE ANALYTICAL PROCESSING: Data Warehouse basic concepts, Data Warehouse Modeling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Data Generalization by Attribute-Oriented Induction.</p> <p>DATA CUBE TECHNOLOGY: Efficient Methods for Data Cube Computation, Exploration and Discovery in Multidimensional Databases.</p>
III	<p>MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations.</p> <p>FREQUENT PATTERN AND ASSOCIATION MINING: A Road Map, Mining Various Kinds of Association Rules, Constraint-Based Frequent Pattern Mining, Extended Applications of Frequent Patterns.</p>
IV	<p>CLASSIFICATION: Basic Concepts, Decision Tree Induction, Bayesian Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy: Ensemble Methods, Handling Different Kinds of Cases in Classification, Bayesian Belief Networks, Classification by Neural Networks, Support Vector Machines, Pattern-Based Classification, Lazy Learners (or Learning from Your Neighbors), Other Classification Methods.</p>
V	<p>CLUSTER ANALYSIS: Basic Concepts of Cluster Analysis, Clustering structures, Major Clustering Approaches, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model Based Clustering - The Expectation-Maximization Method, Other Clustering Techniques, Clustering High-Dimensional Data, Constraint-Based and User-Guided Cluster Analysis, Link-Based Cluster Analysis, Semi-Supervised Clustering and Classification, Bi-Clustering, Collaborative Clustering.</p> <p>OUTLIER ANALYSIS: Why outlier analysis, Identifying and handling of outliers, Distribution Based Outlier Detection: A Statistics-Based Approach, Classification-Based Outlier Detection, Clustering-Based Outlier Detection, Deviation-Based Outlier Detection, Isolation-Based Method: From Isolation Tree to Isolation Forest.</p>
<p>Text Books:</p> <ul style="list-style-type: none"> • Jiawei Han, Micheline Kamber, Jian Pei (2012), Data Mining: Concepts and Techniques, 3rd edition Elsevier, United States of America. <p>Reference Books:</p> <ul style="list-style-type: none"> • Margaret H Dunham (2006), Data Mining Introductory and Advanced Topics, 2nd edition, Pearson Education, New Delhi, India. • Amitesh Sinha (2007), Data Warehousing, Thomson Learning, India. • Xingdong Wu, Vipin Kumar (2009), the Top Ten Algorithms in Data Mining, CRC Press, UK. 	

MCA-303 Cloud Computing

Unit	Contents
I	Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.
II	Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models
III	Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.
IV	Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.
V	Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.
<p>Text Books:</p> <ul style="list-style-type: none"> • Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014 <p>Reference Books:</p> <ul style="list-style-type: none"> • Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011. • Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012. • Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011. 	

MCA-304 Artificial Intelligence

Unit	Contents
I	Meaning and definition of artificial intelligence, Various types of production systems, Characteristics of production systems. Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first Search. A* algorithm, AO* algorithms etc, and various types of control strategies
II	Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic. Resolution, refutation, deduction, theorem proving, inferencing, monotonic and non-monotonic reasoning
III	Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning
IV	Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing
V	Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.
Text Books: <ul style="list-style-type: none">Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education. Reference Books: <ul style="list-style-type: none">E.Rich, K Knight-Artificial Intelligence, Tata McGraw Hills.S.Russell, P.Norving-Artificial Intelligence-A Modern Approach, Pearson Education, Asia.Thomas Dean-Artificial Intelligence-Theory & Practice, Pearson Education, Asia.Alison Caoursey - The Essence of Artificial Intelligence, Pearson Education, Asia.	

Elective-I-A: MCA-305 Software Testing and Quality Assurance

Unit	Contents
I	TESTING FUNDAMENTALS: The Psychology of Testing-Software Testing Principles-Code Inspections-An Error checklist for Inspections-Walkthroughs-Desk Checking-Peer ratings. Definition of bug-Reasons for bug occurrence-Cost of bugs-Role of a software tester Software tester traits-Software Development life cycle models-Testing axioms Software testing terms and definitions.
II	TESTING METHODOLOGIES: White box testing: Statement coverage-Decision coverage-Condition coverage Decision-condition coverage-Multiple-condition coverage. Black box testing: Equivalence Partitioning-Boundary-value analysis-Cause-effect graphing-Error guessing
III	LEVELS OF TESTING: Unit testing-Incremental testing: Top-down testing-Bottom-up testing. System testing: Facility-Volume-Stress-Usability-Security-Performance-Storage-ConfigurationCompatibility-Installability-Reliability-Recovery-Serviceability-Documentation Procedure. Acceptance testing-Case study: Test case design.
IV	APPLYING TESTING SKILLS: Configuration Testing -Compatibility Testing-Usability Testing-Testing the Documentation- Web Site Testing –Testing for Software Security.
V	AUTOMATED TESTING, TEST TOOLS & BUG REPORTING: Automated Testing and Test Tools: -Benefits-Test Tools-Software Test Automation Bug Bashes and Beta Testing-Writing and Tracking Test Cases: Goals-Test Case Planning Overview-Bug’s Life cycle-Bug Tracking System-Software Quality Assurance-Case study: Usage of open source test tool like Selenium and Sikuli for Functional/Regression testing.
<p>Text Books:</p> <ul style="list-style-type: none"> • Glenford J. Myers (2008), The Art of Software Testing - John Wiley & Sons, Second Edition, New Delhi (For Units 1, 2 & 3). • Ron Patton (2007), Software Testing – Pearson Education, Second Edition, New Delhi (For Units 1, 4 & 5). <p>Reference Books:</p> <ul style="list-style-type: none"> • William E Perry (2000), Effective Methods for Software Testing, John Wiley & Sons, Second Edition, New York. • Boris Beizer (1995), Black-Box Testing: -Techniques for Functional Testing of Software and Systems, John Wiley & Sons, New York. 	

Elective-I-B: MCA-305 Application Development Using .NET Framework

Unit	Contents
I	Introduction to .NET Framework: Genesis of .Net, Features of .Net, .Net framework class library, Microsoft Intermediate Language, Meta Data, .Net types and .net name spaces, Common Language Runtime, Common Type System, JIT compilation Common Language Specification, automatic memory management, .Net Applications using command line compiler and visual studio .net IDE. Variables Declaration, Data Type of variables, Forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions, Passing variable Number of Argument Optional Argument, Returning value from function. Control flow statements: conditional statement, loop statement. MsgBox & Inputbox.
II	Windows Programming: Loading, showing and hiding forms, controlling One form within another. GUI Programming with Windows Form: Textbox, Label, Button, Listbox, Combo box, Checkbox, PictureBox, Radio Button, Panel, scroll bar, Timer, ListView, TreeView, toolbar, StatusBar. There Properties, Methods and events. OpenFileDialog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog. Link Label. Designing menus: Context Menu, access & shortcut keys.
III	ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. ADO. NET providers, Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid.
IV	ASP.NET - Advantages of ASP.NET - ASP.NET Architecture – ASP Vs. ASP.NET - ASP.NET Page's Structure - Sample Program in ASP.NET - Page Events - HTML Server Controls - Basic Web Server Controls - Data List Web Server Controls - Validation Controls - Web User Controls in ASP.NET.
V	Advanced Concepts in ASP.NET: Request Object - Response Object - Code-Behind Feature of ASP.NET - Caching in ASP.NET - Output Caching - Fragment Caching - Data Caching - Session / State Management – Events and Abandon Method – Authentication in ASP.NET - Error Handling and Debugging - Tracing an Application – Accessing Data with ADO.NET – Implementing Crystal Reports in ASP.NET
Reference Books: <ul style="list-style-type: none"> • Professional VB. NET, Wrox publication • C# 2012 programming covers .net 4.5, black book, KOGENT learning solutions inc., Dreamtech Pub. • Advance .Net Technology, Chirag Patel, Dreamtech • Publication ASP .NET complete reference, TMH • ASP.NET 2.0, Black Book, Dreamtech • ASP.NET 4, Unleashed – Stephen Walther, Kevin Hoffman, Nate Dudek, Pearson Professional C# .Net, Wrox publication 	

Elective-II-A: MCA-306 System Administration

Unit	Contents
I	Introduction and Concepts: What is System Administration? History of System Administration. System Administration Roles & responsibility. Hardware and Software, System Software, Application Software, Firmware, BIOS, POST sequence, Program, Loader, assembler, Compiler, Linker, Editor, Simulator, Emulator, Debugger.
II	Device Drivers, Software Packages and Programming Languages. Operating System: Types and Functions. DOS – Introduction, Versions, DOS Commands, Internal, External, Root Directory.
III	Linux/Unix: Basics of Linux/Unix Operating System, Services, Installation & Configuration, Maintenance. Linux/Unix Operating System's Kernel, API, CLI, GUI. Difference between Linux/Unix and other operating systems, Features and Architecture, Linux features, advantages, disadvantages.
IV	Windows: Windows as operating system, history, versions. PC hardware, BIOS, Devices and drivers. Kernel Configuration and building. Application installation, configuration and maintenance. Server services and Client services. Difference between windows7/windows10. Introduction of Window server 2016.
V	Networking and Internet: Networking: Concepts, Need, Types, Topologies, Protocols, Introduction to Network Interface Card and Network Operating Systems, Thick and Thin PC's, Virtual PC. Internet: Concept, Different Connection types, Applications.
<p>Text Books:</p> <ul style="list-style-type: none"> • Silberschatz and Galvin, “Operating System Concepts”, 10th edition, Wiley India, 2018. • Essential System Administration (O'Reilly), 3rd Edition, 2001, by Aileen Frisch • Window Server 2016 Administration Fundamentals, by Bekim Dauti, Packt Publishing Ltd. Birmingham, UK. • Andrew S. Tannenbaum,” Computer Networks”, (Third Edition), Prentice-Hall of India Pvt. Ltd, New Delhi. <p>Reference Books:</p> <ul style="list-style-type: none"> • Upgrading and Repairing of PCs, Scott Muller • PC Hardware (A+ Certificate guide), Mike Mayer • Red Hat Linux and Fedora Unleashed – By Bill Ball and Hoyt Duff. • Linux. The Complete Reference. 	

Elective-II-B: MCA-306 ERP Systems

Unit	Contents
I	<p>Introduction: Enterprise wide information system, custom built and packaged approaches, needs and evolution of ERP system common myths and evolving realities.</p> <p>ERP Technologies: ERP and related technologies, business process reengineering and information technology, supply chain management, relevance to data warehousing data mining and OLAP, ERP decision support system.</p>
II	<p>ERP SYSTEM:ERP domain ERP benefits classification, present global and Indian market scenario, milestones and pitfalls, forecast, market players and profiles, evaluation criterion for ERP products.</p> <p>ERP LIFE CYCLE: adoption decision, acquisition, implementation, use & maintenance, evaluation and retirement phases, ERP modules.</p>
III	<p>ERP framework: framework for evaluating ERP, analytical hierarchy processes (AHP), applications of AHP in evaluating ERP, Selection of weights role of consultants, vendors and users in ERP implementation; implementation strategies, ERP customization, ERP-A manufacturing perspective</p>
IV	<p>EVALUATION OF ERP SYSTEM: critical success and failure factors for implementation, model for improving ERP effectiveness, ROI OF ERP implementation hidden costs ERP success inhibitors and accelerators, management concern for ERP success, strategic guide- useful guideline for ERP implementation.</p>
V	<p>ANALYSIS OF ERP IMPLEMENTATIONS: technologies in ERP system and extended ERP case studies development and analysis of ERP implementations in focusing the various issues discussed in above units through soft system approaches or qualitative analysis tools, leaning and emerging issues, ERP and E-Commerce.</p> <p>CONCEPT OF E-Governance: concept, E-Governance frame work area of application like public sector, service industry.</p>
<p>Text Books:</p> <ul style="list-style-type: none"> • Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 1999. • LEXISLEON; enterprise resource planning; TMH <p>Reference Books:</p> <ul style="list-style-type: none"> • BRADY, MANU, Wegner; enterprise resource planning; THM • N.K. Venkita krishnan, vinod kumar garg; ; enterprise resource planning: concept and practice; PHI Learning. • Dimpi Srivastava, Artibatra; ERP SYSTEMS; I K International publishing house. 	

MCA-307 Android Application Development Lab

The student is expected to be able to do the following problems, though not limited.
Contents
1. (a) Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout , (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
<p>Note: Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component.</p> <p>The student should pay attention to the properties of each components, which are used later in Android programming. Following are useful links:</p> <ol style="list-style-type: none">1. http://ai2.appinventor.mit.edu2. https://drive.google.com/file/d/0B8rTtW_91YcITWF4czdBMEpZcWs/view

MCA-308 Data Mining and Warehousing Lab

Contents
1. Installation of WEKA Tool
2. Creating new Arff File
3. Pre-Processes Techniques on Data Set (Pre-process a given dataset based on Handling Missing Values)
4. Generate Association Rules using the Apriori Algorithm
5. Generating association rules using fp growth algorithm
6. Build a Decision Tree by using J48 algorithm
7. Naïve bayes classification on a given data set
8. Applying k-means clustering on a given data set
9. Calculating Information gains measures
10. OLAP Cube and its different operations
11. Case Study: Create Student. ariff file to suggest better college using Decision tree
12. Case Study: Create Placement.ariff file to identify the students who are eligible for placements using KNN

MCA-309 Summer Industrial Training Presentation

Mandatory Summer Training: 45 Working Days Summer Training during Semester Break, of 100 Marks. Evaluation will be done in Semester-III Examinations

GENERAL INSTRUCTIONS FOR PREPARATION OF SUMMER INDUSTRIAL TRAINING PRESENTATION/ REPORT

- (i) Cover Page
- (ii) Title Page
- (iii) Certificate
- (iv) Acknowledgement
- (v) Table of Contents

1. Introduction

2. Project Specifications

- 2.1 Project Need
- 2.2 Project Overview

3. Specific Requirements

- 3.1 External Interface Requirements
- 3.2 Hardware Interfaces
- 3.3 Software Interfaces
- 3.4 Communications Protocols (Networking Protocols)
- 3.5 Security / Maintainability / Performance

4. Software Product Features

- 4.1 System Architecture
- 4.2 Database Requirements
- 4.3 ER Diagram
- 4.4 Data Flow Diagram
- 4.5 Use Case Diagrams
- 4.6 User Interfaces (Input Forms / Processing Forms/ Search Forms/ Output Forms)
- 4.7 Report Formats

5. Drawbacks and Limitations

6. Proposed Enhancements

7. Conclusion

8. Bibliography

9. Annexure:

- 9.1 User Interface Screens (Optional)
- 9.2 Output Reports with Data (if any)
- 9.3 Sample Program Code

MCA-401 Software Project Management

Unit	Contents
I	Project Management: The management spectrum, the people, the product, the process, the project, critical practices Metrics for Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, metrics for small organizations, establishing a software metrics program. Introduction of Project Management tool: Trello, Jira, Asana, Zoho, Wrike.
II	Estimation: Project planning Process, software scope and feasibility, resources, software project estimation, empirical estimation models, estimation for object oriented projects, estimation for Agile development and web engineering projects, the make/buy decision.
III	Project Scheduling: Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Quality Process Planning, Defect Prevention Planning.
IV	Quality Management: Quality Concepts, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances, Change Management: software Configuration Management, The SCM repository, SCM Process, Configuration Management for Web Engineering
V	Project Execution And Closure: Reviews. The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One-Person Review, Guidelines for Reviews in Projects, Project Closure: Project Closure Analysis, The Role of Closure Analysis, Performing Closure Analysis. Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality.
Text Books: <ul style="list-style-type: none"> • Bob Hughes , Mike Cotterell and Rajib Mall “Software Project Management”, 6th Edition, McGraw Hill Edition, 2017. • PankajJalote, “Software Project Management in practice”, 5th Edition, Pearson Education, 2017. • Murali K. Chemuturi, Thomas M. Cagley Jr.” Mastering Software Project Management: Best Practices, Tools and Techniques”, J. Ross Publishing, 2010 • Sanjay Mohapatra, “ Software Project Management” , Cengage Learning, 2011 	
Reference Books: <ul style="list-style-type: none"> • Dr. P. Rizwan Ahmed, “ Software Project Management”, 1st Edition, Margham Publications, 2016 • Walker Royce, “Software Project Management, A Unified Framework”, 1st Edition, 2006. • Joel Henry, “Software Project Management”, 1st Edition, Pearson Education, 2006. • PradeepPai, “Project Management”, , First Edition, Pearson, 2019 	

**Elective-III-A: MCA-402 Principles of Management and Information
System**

Unit	Contents
I	Management: An Overview Definition, Concept, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Difference between Management and Administration. Significance of Values and Ethics in Management.
II	Planning & Organizing: Nature and purpose of planning, Significance of Planning, Elements and Steps of Planning, Types of planning, Objectives and Policies Decision Making, Organizing Principles, Span of Control, Departmentalization, Line and Staff Authority & Relationship, Authority, Delegation and Decentralization. Formal and Informal Organizations
III	Directing & Controlling: Effective Directing, Supervision, motivation theories, motivational techniques, Job Satisfaction, Job Enrichment, Leadership-Concept, Styles and Theories System and Process of Controlling, Concept, Types and Process, Techniques of Controlling, Coordination-Concept, Importance, Principles and Techniques of Coordination, use of computers and IT in Management control
IV	Information System: Data vs. Information vs. Knowledge, Information Systems meaning, functions and dimensions and need. Categorization of Organizational Information Systems – hierarchical and functional perspective, Interdependence between organization and IS, IS strategies for competitive advantage using Porter’s Five Forces Model and Value Chain Model
V	Information Systems Management: Planning the Use of IT, Managing the Computing Infrastructure, Enterprise Applications, Developing Business/IT Solutions, Outsourcing, User Rights and Responsibilities, Implementation and Controlling of Information System
<p>Text Books:</p> <ul style="list-style-type: none"> • Kenneth Laudon, JaneLaudonEssentials ofManagement Information Systems, PHI Publication, 10th Edition • Terry and Franklin, Principles of Management, AITBS Publishers & Distributors, Delhi, Eighth Edition. • Joseph L Massie “Essentials of Management”, Prentice Hall of India, Fourth Edition, 2003. • W.S. Jawadekar, “Management Information Systems”, TMH Publication, Latest Edition <p>Reference Books:</p> <ul style="list-style-type: none"> • PC Tripathi and PN Reddy, “Principles of Management”, Tata McGraw-Hill, Fourth Edition 2008. • Koontz. Essentials for Management: An International Perspective. Tata McGraw-Hill. • Peter Ferdinand Drucker, The Practice of Management, HarperCollins Publishers, 2010. 	

Elective-III-B: MCA-402 Machine Learning

Unit	Contents
I	Introduction: Machine Learning – Machine Learning Foundations, Overview, Applications, Types of Machine Learning – Basic Concepts in Machine Learning – Examples of Machine Learning, Perspectives/Issues in Machine Learning, AI vs. Machine Learning
II	Supervised Learning: Introduction, Linear Models of Classification – Linear Regression – Logistic Regression – Bayesian Logistic Regression – Probabilistic Models Neural Network-Feed Forward Network Functions – Error Back Propagation – Regularization - Bayesian Neural Networks – Radial Basis Function Networks, Ensemble Methods – Random Forest – Bagging – Boosting.
III	Unsupervised Learning: Clustering – K-Means Clustering – EM (Expectation Maximization) – Mixtures of Gaussians – EM algorithm in General – The Curse of Dimensionality – Dimensionality Reduction – Factor Analysis – Principal Component Analysis – Probabilistic PCA – Independent Component Analysis
IV	Probabilistic Graphical Models: Directed Graphical Models – Bayesian Networks – Exploiting Independence Properties – From Distributions to Graphs – Examples – Markov Random Fields – Inference In Graphical Models – Learning - Naïve Bayes Classifiers – Markov Models – Hidden Markov Models. Undirected graphical Models – Conditional Independence Properties.
V	Advanced Learning: Basic Sampling Method – Monte Carlo, Reinforcement Learning-Introduction-The Learning Task, and Elements of Reinforcement Learning. Computer Vision: Applications of Computer Vision Using Machine Learning: Speech Processing, Natural Language Processing
<p>Text Books:</p> <ul style="list-style-type: none"> • Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer 2006 • Ethem Alpaydin, “Introduction to Machine Learning”, Prentice Hall of India, 2005 • Joel Grus, “Data Science from Scratch- First Principles with Python”, O’Reilly, 2015 • Tom Mitchell, “ Machine Learning”, McGraw-Hill, 1997 <p>Reference Books:</p> <ul style="list-style-type: none"> • Stephen MarsLand, “Machine Learning-An Algorithmic Perspective”, CRC Press, 2009 • Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012 • M. Gopal, “Applied MACHINE LEARNING”, McGraw-Hill, 2018 • Mark Summerfield, “Programming in Python 3: A Complete Introduction to the Python Language”, Addison Wesley, 2010 	

Elective-III-C: MCA-402 Data Science with R

Unit	Contents
I	Introduction R: Concept, Advantages of R over Other Programming Languages – R Studio: R command Prompt, R script file, comments – Handling Packages in R: Installing a R Package, Few commands to get started: installed.packages(), package Description(), help(), find.package(), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf.
II	R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame – R – Variables, Data types of Variable, R Operators, R Decision Making: if statement, if – else statement, if – else if statement, switch statement – R Loops: repeat loop, while loop, for loop – Loop control statement: break statement, next statement.
III	R-Function : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values - R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() - R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting - R List - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector - R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division- R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements - R Factors –creating factors, generating factor levels gl().
IV	Data Frames –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame, Expand Data Frame: Add Column, Add Row – Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast(). Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file
V	Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median - Mode - Standard Deviation – Correlation - Data Visualization: visually Checking Distributions for a single Variable - R – Pie Charts: Pie Chart title and Colors – Slice Percentages and Chart Legend, 3D Pie Chart – R Histograms – Density Plot - R – Bar Charts: Bar Chart Labels, Title and Colors
<p>Text Books:</p> <ul style="list-style-type: none"> • Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5. • Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8. <p>Reference Books:</p> <ul style="list-style-type: none"> • Foster Provost & Tom Fawcett, “ Data Science for Business”, O’ Reilly, 2013 • James Warren and Nathan Marz, “Big Data: Principles and Best Practices of Scalable Realtime Data Systems”, Manning Publications, 2015 • Anil Maheshwari, “ Data Analytics”, McGrawHill Publications, 2017 	

MCA-403 Industrial Project

The industrial project as part of the curriculum will be held in the institute as one of the laboratories. This may be in continuation to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level).

The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by SJJTU.

Guidelines for Submission of Industrial Project

All the candidates of MCA are required to submit a Final Project Report based on the work done by him/her during the project period.

THE GUIDE

The Guide for MCA would be a person having MCA with 3 years' experience in academic/Industry.

PROJECT TIME

The MCA Major Projects would be at list 12 Weeks and carries a total of 100 marks. The Project topics should be based on syllabus or as per the requirement of specific industry in sync with the course. Every student has to prepare and submit the project work in a group or separately (Max two students). Plagiarism would not be accepted under any circumstances. Project Report should compulsorily include the software development/ soft copy should also be submitted in CD along with Hard Bound Project report.

Project Evaluation Guidelines

The project is evaluated on the basis of following aspects:

Presentation & Software execution: 40% of total marks.

Project report (documentation): 30% of total marks.

Viva-Voce: 30% of total marks.

SUMMARY/ABSTRACT

All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up.

The write up must adhere to the guidelines and should include the following:

- Name / Title of the Project and about the Problems
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT: This should be explicitly mentioned at the beginning of the Synopsis. This being the overall impression on the future work, the topic should be able to corroborate the work.

OBJECTIVE AND SCOPE: This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DISCRPTION: The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS: The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION: The write-up must end with the concluding remarks-briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest.

The following suggested guidelines must be followed in preparing the Final Project Report:

The industrial project as part of the curriculum will be held in the institute as one of the laboratories. This may be in continuation to the project under taken by the student during industrial training and/or of industrial nature and/or have good industrial significance and/or may be done in collaboration with industry (as per suitability at the institute level). The evaluation will be done in the institute by one internal examiner and one external examiner (from outside the institute) appointed by SJJTU.

The Project study and development should be on the following lines:

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION

1. Cover Page as per specified format
2. Declaration Certificate

3. Acknowledgement
4. Certificate of the Company /Institute
5. Main Report

1. Introduction

- 1.1 Objectives
- 1.2 Problem description
- 1.3 About Organization

2. System Study

- 2.1 System with limitations
- 2.2 Significance of the Project
- 2.3 Beneficiaries of the System
- 2.4 Feasibility study

3. System Analysis Requirement Specification

- i. Functional Requirement.
- ii. Non Functional Requirement.
- iii. User Requirement
- iv. System Requirement

4. System Design

- a) Data Flow Diagram
- b) E-R Diagrams
- c) Use Case Diagrams
- d) Flow Charts
- e) Database Tables
- f) Input output Forms

5. Development

- a) Environment
- b) Coding Style
- c) Coding Techniques
- d) Coding

6. Testing

- a. Test cases

7. System Security

- a. Checks and Control
- b. Encryption, secure

8. Conclusion/Future Enhancement

9. Bibliography

The reports prepared by the students **MUST NOT** have only definitions of the above mentioned topics but should explicitly state these in the context of the project undertaken. They should submit the actual work done in details.

General instructions about preparation of report

Paper: A4

Font: Times New Roman, Bookman Old Style

Chapter Heading: 16pt, Sub heading: 14, Sub-Sub Headings: 12

Bold Running Matter: 12 pt

Paragraph Gap: 6 Pt Maximum

Line Gap: 1.5

Margins: Left 1.5, Right, Top and Bottom 1 inch

All diagrams/figures and tables should be appropriately numbered.

Submission of Project Report to the University

The student will submit his/her project report in the prescribed format. The Project Report should include:

- Copy of the Summary/Abstract. To be mailed to college/Institute well in advance mentioning the about future project which would be undertaken.
- Two Hard Bound Copies of the Project Report which is around 80 to 120 pages.
- Soft copy of project on CD/DVD/Pen Drive pasted inside of the back cover of the project report.

Binding & Color code of the report/Thesis

- ✓ **For MCA – IV Semester (Industrial Project work)**
- ✓ **Hard Bound Report**
- ✓ **Cover/Background of the Page of Project Report – Sky Blue**
- ✓ **Letters in Black**

An
Industrial Project Report

On

<“Write title of Project”>

Submitted to the Department of Computer Science & Engineering,
Shri Jagdishprasad Jhabarmal Tibrewala University

Partial fulfillment of the requirement for the degree of

MASTER OF COMPUTER APPLICATION



Supervisor
<Name>
Designation

Submitted By:
<Name of Candidate >
Roll No.:

Department of Computer Science & Engineering
Shri Jagdishprasad Jhabarmal Tibrewala University,
Jhunjhunu (Rajasthan) - 333010

Month and Year

Candidate's Declaration

I hereby declare that the work, which is being presented in the MCA-403, Industrial Project, entitled “..... (Title)”in partial fulfillment for the award of Degree of “Master of Computer Applications” in Department of Computer Science & Engineering submitted to the Shri Jagdishprasad Jhabarmal Tibrewala University is a record of my own work carried under the Guidance of Shri/ Dr., Department of Computer Science & Engineering, Shri Jagdishprasad Jhabarmal Tibrewala University .

I have not submitted the matter presented in this Project Report any where for the award of any other Degree.

<Name and Signature of Candidate>

Roll No.:

Name(s) of Supervisor(s)

.....
.....

Shri Jagdishprasad Jhabarmal Tibrewala University
Department of Computer Science & Engineering

Certificate

Date:

This is to certify that the Industrial Project (MCA-403) work entitled “*name of the project*” submitted by “*name of student*” (SJJTU Roll No.)to the Department of Computer Science and Engineering, Shri Jagdishprasad Jhabarmal Tibrewala University has been examined and evaluated.

The Project work has been prepared as per the regulations of Shri Jagdishprasad Jhabarmal Tibrewala University, Jhunjhunu and qualifies to be accepted in partial fulfillment of the requirement for the degree of MCA (Master of Computer Applications).

Signature of the student

Supervisor/Guide

(Name with Designation)

External Examiner

(Name with Designation)

Head of Department/Institute

On Original Company Letter Head

Ref No.....

Date:

Certificate

This is to certify that **your name (SJJTU Roll No.)** is/was under training from _____(**start date**) to _____(**end date**) under my supervision in partial fulfillment of the requirement for the award of the Degree of **Master of Computer Applications**.

During this period he /she has work done..... (“ **Project Name**”) as a(**Role of student**).

Training Incharge /Project Leader/HR

(Seal/Sign and Name with Designation)