MAULANA AZAD NATIONAL URDU UNIVERSITY

SCHOOL OF TECHNOLOGY

DEPARTMENT OF CS&IT

MCA Curriculum

1. **Programme Title:**

   Master of Computer Application

2. **Duration and Mode:**

   Duration of the programme for a student shall be three (3) years with six consecutive semesters after admission. The mode of the programme is Regular (semester system).

3. **Objective:**

   To produce, theoretically and practically well-equipped, skilled professionals to cater to the requirements of technical Assistance, software related maintenance and state-of-the-art software development practices in the fast changing IT-enabled systems.

4. **Eligibility Criteria:**

   Any graduate (B. Sc/B.A/B.Com/BCA/BBA/B.Tech/B.E etc.) having mathematics subject at 10+2 level with 45% marks in aggregate. Knowledge of Urdu language is essential.

5. **Intake:**

   The number of seats for the program is thirty (30).

6. **Admission:**
   The admission to the MCA programme is based on the rank secured by the candidate in a written test conducted by the University. Minimum qualifying marks shall be 30% in Entrance Test. The written test will be of 100 marks.

7. **MCA Exit Scheme (Minimum Degree Requirement):**

   a) Student can exit the MCA course after one academic year with PGDIT diploma if he/she obtains the total number of 48 credits in one academic year.

   b) Student can exit the MCA course after two academic years with M.Sc. (IT) degree if he/she obtains the total number of 96 credits in two academic years. Such students shall inform his/her interest to exit with M.Sc. (IT) degree to the Head of Department at the beginning of the third (3^{rd}) semester. Such student will follow the sixth (6^{th}) semester curriculum in place of fourth (4^{th}) semester.

   The minimum degree requirement of the programme is as follows:
   a) **PGDIT** Total Credit = 48 & minimum CGPA = 5.0 after completing first 2 Semesters
   b) **M.Sc.(IT)** Total Credit = 96 & minimum CGPA = 5.0 after completing first 4 Semesters
   c) **MCA** Total Credit = 140 & minimum CGPA = 5.0 after completing all 6 Semesters

8. **Syllabus:** Each of the theory or lab courses shall have prescribed syllabus approved by BOS from time to time, as per following prescriptions:

a. **Theory Courses:** Five (5) units largely based on ONE standard textbook and two Reference Books prescribed by the concerned teacher.

b. **Lab Courses:** At least TEN (10) individual generic assignments and ONE Mini Project, to be prescribed by the concerned teacher and approved by HoD.

9. Skill Set: A student on completion of MCA programme shall be equipped with the following tentative skill sets.

a. **Operating Systems:** Windows OS, Linux, Unix etc.
b. **Programming Languages:** C, C++, HTML, Java, VB.NET, ASP.NET & Prolog etc.
c. **PC Softwares:** MS Office, Antivirus Tools etc**.**
d. **Packages:** Oracle, OpenGL, WEKA etc.

10. Evaluation of Project:

Every candidate shall be required to submit Project as per the following details:-

i. **A Project Review Committee** (PRC) shall be constituted with Head of the Department as chair person and at-least two other faculty members from the department.

ii. **Registration of Project Work:** A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects (theory and practical subjects).

iii. After satisfying clause 11.a (ii), a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Project Review Committee for its approval. Only after obtaining the approval of Project Review Committee the student can initiate the Project work.

iv. Three copies of the Project Report certified by the supervisor shall be submitted to the Department.

v. The project report shall be examined by one examiner selected by the University. For this, Head of the Department shall submit a panel of 3 examiners, who are eminent in that field with the help of the concerned guide.

vi. If the report of the examiner is not favorable, the candidate shall revise and resubmit the report, in the time frame as described by PRC. If the report of the examiner is unfavorable again, the report shall be rejected.

vii. If the report of the examiner is favorable, viva-voce examination shall be conducted by a board consisting of the supervisor, Head of the Department and the examiner. The Board shall jointly report candidates work as:

1. Excellent
2. Good
3. Satisfactory
4. Unsatisfactory

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

viii. If the report of the viva-voce is unsatisfactory, the candidate will retake the viva-voce examination within three months.

MCA Syllabus

COURSE	SEM	CODE	COURSE TITLE	L-T-P	Credits	Internal Marks	External Marks	Total Marks
PGDIT	I	MMCA101BST	Probability & Statistics	3-1-0	4	30	70	100
		MMCA101PCT	Mathematical Foundation of Computer Science	3-1-0	4	30	70	100
		MMCA102PCT	Programming with C	3-1-0	4	30	70	100
		MMCA103PCT	E-Commerce	3-1-0	4	30	70	100
		MMCA101HST	English Language Communication Skills	3-1-0	4	30	70	100
		MMCA101NCT	**Tarseel-e-Urdu	3-0-0	---	30	70	100
		MMCA150PCP	Computer Programming Using C	0-0-3	2	50	50	100
		MMCA151PCP	PC Software	0-0-3	2	50	50	100
		Total			24			700
	II	MMCA201PCT	Computer System Architecture	3-1-0	4	30	70	100
		MMCA202PCT	Object Oriented Programming Using C++	3-1-0	4	30	70	100
		MMCA203PCT	Data Structures	3-1-0	4	30	70	100
		MMCA204PCT	Operating Systems	3-1-0	4	30	70	100
		Elective-I : MMCA201PET- MMCA205PET		3-1-0	4	30	70	100
		MMCA250PCP	OOPS Using C++ Lab	0-0-3	2	50	50	100
		MMCA251PCP	Data structures Using C Lab	0-0-3	2	50	50	100
		Total			24			700
M. Sc IT	III	MMCA301PCT	Data Base Management System	3-1-0	4	30	70	100
		MMCA302PCT	Analysis & Design of Algorithms	3-1-0	4	30	70	100
		MMCA303PCT	Computer Networks	3-1-0	4	30	70	100
		MMCA304PCT	Java Programming	3-1-0	4	30	70	100
		Elective-II : MMCA301PET- MMCA305PET		3-1-0	4	30	70	100
		MMCA350PCP	DBMS LAB	0-0-3	2	50	50	100
		MMCA351PCP	Java Programming LAB	0-0-3	2	50	50	100
		Total			24			700
	IV	MMCA401PCT	Software Engineering	3-1-0	4	30	70	100
		MMCA402PCT	Data Warehousing and Data Mining	3-1-0	4	30	70	100
		MMCA403PCT	Formal Language & Automata Theory	3-1-0	4	30	70	100
		MMCA404PCT	Computer Graphics	3-1-0	4	30	70	100
		Elective-III: MMCA401PET- MMCA405PET		3-1-0	4	30	70	100
		MMCA450PCP	UML LAB	0-0-3	2	50	50	100
		MMCA451PCP	Linux Programming LAB	0-0-3	2	50	50	100
		Total			24			700
M.C.A	V	MMCA501PCT	Cloud Computing and Virtualization	3-1-0	4	30	70	100
		MMCA502PCT	Web Technology	3-1-0	4	30	70	100
		MMCA503PCT	Cryptography & Network Security	3-1-0	4	30	70	100
		MMCA504PCT	Artificial Intelligence	3-1-0	4	30	70	100
		Elective-IV: MMCA501PET- MMCA505PET		3-1-0	4	30	70	100
		MMCA550PCP	Web Technology LAB	0-0-3	2	50	50	100

		MMCA551PCP	Artificial Intelligence LAB	0-0-3	2	50	50	100
		Total			24			700
	VI	MMCA650PCP	Project	----	16	200	200	400
		MMCA651PCP	Seminar	-----	4	50	50	100
		Total			20			500

Elective-I	Elective-II	Elective-III	Elective-IV
MMCA201PET- Accounting and Financial Management MMCA202PET- Multimedia Applications MMCA203PET-Client Server Computing MMCA204PET- Soft Computing MMCA205PET- Information Security and Cyber Laws	MMCA301PET- Mobile Computing MMCA302PET- Advance Operating System MMCA303PET- Component Based Software Engineering MMCA304 PET- Information Retrieval Systems	MMCA401PET- Distributed System MMCA402PET - Software Testing and Quality Assurance MMCA403PET - Software Project Management MMCA404PET - Compiler Design	MMCA501PET - Software Agent MMCA502PET- Advance Computer Network MMCA503PET- Software Quality Engineering MMCA504PET- Distributed Database

**Tarseel-E-Urdu is treated as a non-credit course; hence the marks will not be added in the result.

* For M.Sc (IT) degree, the student will follow the sixth semester in place of fourth semester.

PGDIT	M. Sc.(IT)	MCA
(Valid Credits: 48)	(Valid Credit: 96)	(Valid Credits: 140)

Course Code	Course Title	Lecture			
MMCA101BST	Probability & Statistics	L	T	P	Semester: I
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To improve the data analytical skills.
2. To manage the events with the help of permutations, combinations and space samples.
3. To test the Hypothesis and Data interpretation.

Course Outcomes:

1. Generate the report for particular information from existing data.
2. Design the hypothesis and test it after that would be able to make decisions.
3. Manage an event in an optimal way.

Detailed Contents:

Unit: 1	Probability: Sample space and events – Probability – The axioms of probability - Some elementary theorems –Addition theorem on probability & problems, Multiplication theorem &Conditional probability – Baye's theorem and related problems
Unit: 2	Random variables – Discrete and continuous – Distribution – Distribution function. Distribution - Binomial, Poisson and normal distribution – related properties, moments, central moments, moment generating function and related problems.
Unit: 3	Sampling distribution: Populations and samples - Sampling distributions of mean (known and unknown) proportions, sums and differences. Estimation: Point estimation – interval estimation - Bayesian estimation.
Unit: 4	Test of Hypothesis – Means and proportions – Hypothesis concerning one and two means – Type I and Type II errors. One tail, two-tail tests. Tests of significance – Student's t-test, chi square –test of goodness of fit and test of independence.
Unit: 5	Curve fitting: The method of least squares – Inferences based on the least squares estimations Curvilinear regression –– correlation coefficients-Karl persons and Spearman's rank correlation coefficient.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Probability and Statistics for Engineers (Erwin Miller And John E.Freund), R A Johnson and C.B.Gupta, 7th edition, Pearson Education / PHI.
2	Introduction to Probability and Statistics, W.Mendenhall, R.J.Beaver and B.M.Beaver, Thomson. 12th edition, (Indian edition).

Reference Books:

1	Text book of Probability and Statistics Dr.Shahnaz Bathul, V.G.S.Publishers 2003
2	Probability and Statistics in Engineering, , William W.Hines, Douglas C.Montgomery, David M.Goldsman, Connie M.Borror, 4th Edition Wiley Student Edition

Course Code	Course Title	Lecture			
MMCA101PCT	Mathematical Foundation of Computer Science	L	T	P	Semester: I
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To improve the knowledge of Computational Modeling. Learn how computational models work.
2. To understand the scope of mathematics in computer science
3. To perform Computational job partition for quick process by compiler.

Course Outcomes:

1. Understand the complexity of computational problems
2. Think about the design of formal language which would be able to address any real time problem
3. Improve the working flow of computational models.

Detailed Contents:

Unit: 1	Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.
Unit: 2	Relations: Properties of binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram. Functions: Inverse Function, Composition of functions, recursive Functions, Lattice and its Properties, Pigeon hole principles and its application.
Unit: 3	Elementary Combinatorics: Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorem, the principles of Inclusion – Exclusion.
Unit: 4	Recurrence Relations: Generating Functions, Function of Sequences, Calculating Coefficients of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, solution of non-homogeneous Recurrence Relations.
Unit: 5	Graph Theory: Representation of Graphs, DFS, BFS, Spanning Trees, Planar Graphs. Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Mathematical Foundation of Computer Science – ShahnazBathul, PHI
2	Elements of Discrete Mathematics- A Computer Oriented Approach,C.L.Liu, D.P. Mohapatra,3edition,TMH.

Reference Books:

1	Discrete Mathematics and its applications, 6th edition, K.H.Rosen, TMH
2	Discrete Mathematical Structures, Mallik and Sen, Cengage Learning.

Course Code	Course Title	Lecture			
MMCA102PCT	Programming with C	L	T	P	Semester: I
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To improve the basic Programming Skill
2. To understand the utilization of control statements key words and basic definition of variable.
3. To aware about the Array, Structure and Pointers Operations in data structures in Programming

Course Outcomes:

1. Write a code for an Algorithm
2. Understand the flow of data and instructions in programming
3. Minimize the code , memory space and time after using data structure and pointers

Detailed Contents:	
Unit: 1	**Introduction to programming** – definitions and developing Algorithms and flowcharts for simple programs. Introduction to C Programming: Origin and history of c programming character set, Identifiers and keywords data types, constants, variables, operators, special operators, constants, Expressions, compound statements, structure of C program, Input and output function
Unit: 2	**C Statements** – selection statements – if nested if's, the if-else –if ladder the conditional expressions, switch statement nested switch statements, iteration statements – the for loop, for loop variations, the while loop, the do-while loop, declaring variable with in selection and iteration statements, jump statement, the return statement, the go to submit, break statement, exit () function, the continue statement, expression statement. Block statements.
Unit: 3	**Arrays** – Array what is an array? – Array Declaration, Array Initialization – Accessing individual elements of an array – Two Dimensional Arrays – Multi Dimensional Array, Passing an array element to a function – Rules of using an array. What are strings? String I/O, string Manipulation.
Unit: 4	**Functions** – The General Form of a Function, Math functions, elements of function, function categories, types of functions, Function Arguments Call by value, Call by Reference, return statement. Uses of functions. C pre – processor, storage classes – Automatic – Register, Static and external. **Pointers** –definition, pointer variables, pointer expressions, arithmetic pointers, pointers andarrays, initializing pointers and functions and problems with pointers.
Unit: 5	**Structures** – definition, accessing structure members, structure assignments, array of structures, passing structures, structure pointers, uses of structures **Unions** – definitions, difference between structure and union, type def. **Files** – introduction to streams and files, basics of files – file pointer, opening and closing files, writing and reading character, file functions.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Let Us C by Yashwanth Kanethar, BPB Publishers.
2	
Reference Books:	
1	Complete Reference of C++ by Herbert Schilde.
2	Programming in ANSI C" by E. Balaguruswamy

Course Code	Course Title	Lecture			
MMCA103PCT	E-Commerce	L	T	P	Semester: I
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Understand online business activities such as selling, purchasing, Ordering etc.
2. To understand about financial activities such utilization of cards (Credit Card, Debit Card), Money transformation etc.
3. To Review ability of existing business portal to make the future plan for business.

Course Outcomes:

1. Take decision as quick as possible in business environment. Promote the Digital World to make secure digital transactions.
2. File the various time of taxes and bills such as income tax, sell tax, eclectic bill, phone bill etc.
3. Aware about the used technology and security issues with any transaction.

Detailed Contents:	
Unit: 1	Introduction to Electronic Commerce – E-Commerce Framework- Anatomy of E-Commerce Applications – E-Commerce Consumer & Organization Applications- E- Commerce and World Wide Web – Internet Service Providers – Architectural Framework for Electronic Commerce – WWW as the Architecture- Hypertext publishing.
Unit: 2	Electronic Payment Systems – Types of Electronic Payment Systems – Digital Token Based Electronic Payment System – Smart Cards – Credit Cards – Risk in Electronic Payment **Systems –** Designing Electronic Payment Systems.
Unit: 3	Electronic Data Interchange, EDI Applications in Business, EDI implementation, MIME, and value added Networks Work flow automation and Coordination, Customization and Internal Commerce, Supply Chain Management(SCM).
Unit: 4	Corporate Digital Library – Document Library, Digital Document Types, Corporate Data Warehouse, Advertising and Marketing – Information based Marketing, Advertising on Internet, On-Line Marketing Process, Market Research.
Unit: 5	Consumer Search and Resource Discovery – Information Search and Retrieval, Commerce Catalogues, Information Filtering Multimedia – Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Bajaj and Nag. "E-Commerce the cutting edge of Business". TMH.
2. Daniel Minoli, Emma Minoli: "Web Commerce Technology Handbook", Tata McGraw Hill.

Reference Books:

1. Ravi Kalakota & A. B. Whinston - "Frontiers of Electronic Commerce", Pearson Education, India, 1999.
2. E-Business & Commerce: Brahm Cazner, Wiley dreamtech.

Course Code	Course Title	Lecture			
MMCA101HST	English Language Communication Skills	**L**	**T**	**P**	**Semester:** I
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Learn of English for Writing,
2. Reading and Speaking
3. Learn of Communicational etiquettes and Presentation.

Course Outcomes:

1. Speak, Read English Language
2. Write the English Language
3. Present yourself, your view, idea and argument politely.

Detailed Contents:	
Unit: 1	Listening: Barriers of Listening skill-Approaches to Listening –How to improve Listening-exercises. Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills– Public speaking- Expressing Techniques.
Unit: 2	Reading: Kinds of Reading – Causes of reading difficulties – Reading strategies – exercises. Writing: Effective writing – Paragraph – Essay- Reports – Letters- Articles – Notices, Agenda & Minutes.
Unit: 3	Communication: Modes of Communication- Barriers – Interpersonal skills – Negotiation skills – Non- Verbal communication - Etiquettes
Unit: 4	Group Dynamic skills: Group Discussion – Team building & Team work – Be a manager or leader – Decision making – creativity – Time & Stress management skills.
Unit: 5	Interview sills: Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview _ Mock Interview _ Quick Tips.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:	
1	An outline of English phonetics, Jones, Daniel.
2	Business communication and Organization & Management, Aggarwal, Rohini.
Reference Books:	
1	Burnard, Philip. Interpersonal skills Training: A source book of activities. 2005.
2	Soft Skill: Know Yourself & Know the World, Dr. Alex, K.. 2010.

Course Code	Course Title	Lecture			
MMCA101NCT	**Tarseel-e-Urdu	L	T	P	Semester: I
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Learn Urdu for Writing, Reading
2. To Speak Urdu
3. To Learn Communicational etiquettes and Presentation

Course Outcomes:

1. Speak, Read
2. Write the Urdu Language
3. Present yourself, your view idea and argument politely.

Detailed Contents:

Unit: 1	اردو حروف تہجی، حروف تہجی کی شکلیں ، دو چشمی ھ ، حروف کی تحریر،اعراب، دو حرفی الفاظ،تین حرفی الفاظ،چار حرفی الفاظ، دو لفظی جملے،چار لفظی جملے
Unit: 2	دن اور مہینے، پھل اور سبزیاں ، موسم اور آب و ہوا، گھر اور چیزیں
Unit: 3	بازار، ڈاک گھر، ریلوے اسٹیشن، بینک، عام استعمال کے چند الفاظ، خاص موقعوں کے جملے، اعداد
Unit: 4	اسم، ضمیر، فعل، صفت، اسم فعل اور صفت کی جمع، محاورے اور ضرب الامثال
Unit: 5	عبارتیں ، نظمیں ، کہانیاں ، مولانا آزاد نیشنل اردو یونیورسٹی کا ترانہ

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1.
2.

Reference Books:

1.
2.

Course Code	Course Title	Lecture			
MMCA150PCP	Computer Programming Using C	L	T	P	Semester: I
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. Learn about security management and cyber law.
2. Familiarize principle of information security.
3. Know about Security Architecture and its models and cryptographic algorithms.

Course Outcomes:

1. Understand the constraints of cyber law and security concern.
2. Understand the importance of information security and how can manage the security of network as well as data.
3. Know the working of security models and applied algorithms.

Detailed Contents:

1. Write C program to input and output the text message.
2. Write C Program to perform all arithmetic operations.
3. Write C Program to utilize the math function.
4. Write C Program to perform the mathematical expressions.
5. Write C Program for Local and Global Variables.
6. Write C Program for internal static and external static variables.
7. Write C Program to find the roots of a Quadratic equation.
8. Write C Programs for all the Operators. (Arithmetical, Logical, Relational, Bitwise).
9. Write C Programs for Increment and Decrement Operators.
10. Write C Programs to implement the Ternary Operator.
11. Write C Programs for special Operators.
12. Write C Programs for all the Control Structures. (Sequential Control Structures, Conditional Control Structures, Iterative Control Structures).
13. Write C Programs to display the different types of patterns using nested for loop.
14. Write C Program for Statements. (switch, break, goto, continue etc.,).
15. Write C Program to print biggest number from n numbers.
16. Write a C Program to find the given integer number is even or odd number.
17. Write a C Program to calculate the factorial of a given number.
18. Write a C Program to swap the two numbers using temp variable and without using temp variable.
19. Reading and Printing a single dimensional array of elements.
20. Ascending and descending of an array.
21. Sum of all odd numbers and sum of all even numbers in a single dimensional array.
22. Mathematical operations on single dimensional arrays.
23. Reading and Printing a multi dimensional array of elements.
24. Mathematical operations on multi dimensional array of elements.
25. Passing an array element to a function.
26. Reading and Printing a string.
27. C Programs on String functions.
28. Write a C program to calculate string length by writing the user-define function.
29. Function declaration and initialization.
30. C Program to differentiate the parameters and arguments in functions.
31. Programs for different types of inbuilt functions.
32. Call by value and Call by reference programs in functions.
33. Write a program to swap the given 2 number using passing by reference.
34. Write C Programs to perform all valid arithmetic operations using pointers.
35. C programs on Structures and accessing of members of the structures.
36. Write a C program to print a book information (Book name, Book no, author name) by writing a structure.
37. Write a C program by passing structure elements to a function and display employee information (emp no, emp name, emp salary, and emp address).
38. C Programs on Reading a file from the secondary storage device.
39. C Program on writing and appending a file on the secondary storage device.
40. C Program on Opening and closing a file.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications.

Reference Books:

1. Let Us C by Yashwanth Kanethar

Course Code	Course Title	Lecture			Semester: I
MMCA151PCP	PC Software	L	T	P	
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. To be familiar with Computer softwares as well as hardware.
2. To use MS Office (Word, Power Point, Excel, and Access) and it's utility.
3. To create the database.

Course Outcomes:

1. Use the MS Office Suits and its services.
2. Write resume
3. Make presentation

Detailed Contents:

Application Software: Enables the students in crafting Professional word documents,
Excel Spreadsheets, PowerPoint Presentations and making documents in Urdu.

Ms-Word:-

Week1-Task1**:** Creation of a document, saving a document in desire location by using SAVE AS option, editing the document, usage of SAVE option, Usage of functions like Cut, Copy, Paste.

1. Write steps for creating a document and save that document in D drive?
2. Edit the existing document and save the changes?
3. Write steps for copying the text and pasting it on next page?
4. Write steps for cutting the unwanted text?

Week 2-Task 2: Highlighting the text, changing the color of text. Changing text attributes, Applying different types of bullets and numberings to text.

1. Write steps for highlighting the text?
2. Write steps for making text Bold, Underline and Italic?
3. Write steps for applying different types of numbering?
4. Write steps for applying different customized Bullets; use any picture as a bullet?

Week3-Task3: Creating tables, altering the table by adding additional rows and columns.
Deleting a particular row or column, splitting the cells and merging the cells. Applying different types of Table Auto Formats to tables.

1. Write steps for creating a table with 10 rows and 7 columns?
2. Write steps for aligning the text in the center of the cell and apply the different?
3. Write steps for adding one row below 5^{th} row and add one column in between 5^{th} and 6^{th} column?
4. Write steps for merging the 6 columns of a last row and split the 2^{nd} column in to 2 sub columns?
5. Write steps for applying Table Auto format to the above table?

Week4-Task4: Mail Merge, Inserting page numbers. Adding Header and Footer to each page in a document .Using Spell check function to check the spellings of text. Finding the synonyms of a particular word. Printing the document

1. Write steps for inserting page numbers on each page?
2. Write complete steps for Mail Merge?
3. Write steps for adding header and footer to each page of a document?
4. What do you mean by spell check? How the spell check will be used in a document?
5. What is the process for finding the synonyms of a given word?

Ms- Excel:-

Week5-Task5: Creating the worksheet, Entering text in to cells, renaming the worksheet, Adding a new worksheet and deleting a worksheet from a workbook. Saving the workbook by using SAVE option. Using formula function to calculate mathematical operations like SUM, AVG…

1. write the no of rows and columns in worksheet
2. Steps for renaming a work sheet?
3. Steps for adding new work sheet?
4. Create a worksheet for calculating marks of 10 students, perform total of marks by using Sum formula.
5. Find the average of a number from the list of 20 numbers.

Week6-Task6: Highlighting the cells, changing the color of text in cells. Giving borders to cells. Sorting the given data in Ascending or Descending order.

1. Write steps for highlighting the cells.

2. Write steps for changing the color of text in cells.
3. Write steps for giving borders to cells.
4. Sort the given data in ascending order and descending order.

Week7-Task7: Using Logical functions. Inserting charts like Line chart, Pie chart, Bar chart to convert the information in graphical representation. Statistical functions.

1. Create a mark sheet of 10 students and perform Sum, average, result.
2. Calculate the rank and division of above students.
3. Convert the given mark sheet into different types of charts.
4. Use statistical functions to calculate Mean, Median, Mode, Standard Deviation, Variance, and Co-relation.

Ms-PowerPoint:-

Week 8-Task 8: Creating power point presentation by using slides, inserting a new slide in a presentation, Applying different slide Layouts, deleting a particular slide, saving the presentation

1. Write steps for inserting a new slide into presentation.
2. Write steps for applying different slide layouts to each slides.
3. Create a PPT with minimum of 5 slides by applying different layouts to each slide.
4. How will you delete the unwanted slide from your presentation?

Week 9-Task 9: Inserting of text boxes and Word Art option for entering the text into a slide, Inserting pictures, charts and Tables in a slide, viewing the presentation in Slide show.

1. Insert the text into slide by taking one text box.
2. Write headings or Titles by using Word Art.
3. Insert different pictures and charts into your presentation.
4. Create a PPT of min 5 slides insert some pictures and text boxes in slides and view this presentation by Slide show, and write steps to do this.

Week 10-Task 10: Applying different slide design to slides, Applying different slide color schemes and Animation Schemes to a presentation, applying the effects to the text and Images of a slide by using custom animation, applying the effects to the slides by using slide transition schemes.

1. Write steps for applying different slide designs to each slide.
2. Write steps for applying different slide Color scheme to each slide.
3. Write steps for applying different slide animation scheme to each slide.
4. Apply custom animation to text and images.
5. Create a PPT of minimum 10 slides and apply different attributes to your presentation.

Ms-Access:-

Week 11-Task 11:

1. Write steps for opening Ms-Access
2. Write steps for saving Database and Table
3. Create a Student Database with the following details:
   Student Name, Number
   Total Marks, Address.

Week 11-Task 11:

1. Create an employee database with your own fields and prepare reports.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	
2	
Reference Books:	
1	
2	

Course Code	Course Title	Lecture			
MMCA201PCT	Computer System Architecture	L	T	P	Semester: II
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To know about the hardware architecture of Computer System such as Circuit Theories, decoder, Multiplexers, Registers, Accumulator, Processor etc.
2. To understand the Connectivity of System's parts that how they are following instruction.
3. To understand about Organization of Memory, CPU Organization, DMA Controller, Pipelining of Process, Addressing Modes etc

Course Outcomes:

1. Understand the processing of Computer.
2. Know the function of Memory and its types.
3. Know about the function and organization of Input Output devices.

Detailed Contents:	
Unit: 1	Digital Logic Circuits: Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip Flops, Sequential Circuits. Digital Components: Integrated Circuits, Decoder, Multiplexers, 'Registers, Shift Registers, Binary counter, Memory unit. Data Representation: Data types, Complements, Fixed and Floating Point Representation, Other binary codes and error Detection codes.
Unit: 2	Register Transfer and Micro operations:. Register Transfer language, Register transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations and Arithmetic logic shift unit. Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycles, Memory Reference Instructions, Input, Output and Interrupts, Design of Accumulator logic.
Unit: 3	Programming the Basic Computer: Introduction, Machine Language, Assembly Language, The Assembler, Programming Arithmetic and Logic Operations, Subroutines, and input -output ,Programming. Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.
Unit: 4	Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC. Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline. Computer Arithmetic: Addition and Subtraction, Multiplication algorithms, Division Algorithms, Floating point arithmetic operations, decimal arithmetic unit, and decimal arithmetic operations.
Unit: 5	Input -Output organization: Peripheral Devices, I/O output interface, Asynchronous data transfer, Modes of transfer, Priority Interrupt, DMA, Input output Processor, Serial Communication. Memory Organization: Memory Hierarchy, Main Memory, Cache Memory.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Computer System Architecture, M. Morris Mano, Pearson Asia / Prentice Hall, Third edition, 1993.
2	

Reference Books:

1	Fundamentals of Computer Organization and Design, Sivarama P Dandamudi Springer/ Dream Tech Publishers, 2003.
2	William Stallings, "Computer Organization & Architecture", Pearson Education, Sixth: Edition, 2003.

Course Code	Course Title	Lecture			
MMCA202PCT	Object Oriented Programming Using C++	L	T	P	Semester: II
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To enhance the programming skill with the help of object oriented approach.
2. To use objects and classes for write the code of some real life problems.
3. To understand the utility of Object, Class, Abstraction, Inheritance, Polymorphism, Aggregation and Generalization techniques in C++.

Course Outcomes:

1. Create object in a class and its utilization.
2. Optimize the programming code with the help of Object oriented approach such as Abstraction, Inheritance and Polymorphism etc.
3. Design class diagram to understand the flow of data and instructions.

Detailed Contents:

Unit: 1	Principles of OOP: Programming paradigms, basic concepts, benefits of OOP, applications of OOP Introduction to C++: History of C++, structure of C++, basic data types, type casting, type modifiers, operators and control structures, input and output statements in C++. Classes and objects: class specification, member function specification, scope resolution operator, access qualifiers, instance creation.
Unit: 2	Functions: Function prototyping, function components, passing parameters, call by reference, return by reference, inline functions, default arguments, overloaded function. Pointers: Array of objects, pointers to objects, this pointer, dynamic allocation operators, dynamic objects.
Unit: 3	Constructors: Constructors, parameterized constructors, overloaded constructors, constructors with default arguments, copy constructors, static class members and static objects. Operator overloading: Overloading unary and binary operator, overloading the operator using friend function, stream operator overloading and data conversion.
Unit: 4	Inheritance: Defining derived classes, single inheritance, protected data with private inheritance, multiple inheritance, multi-level inheritance, hierarchical inheritance, hybrid inheritance, multi path inheritance, constructors in derived and base class, abstract classes, virtual function and dynamic polymorphism, virtual destructor.
Unit: 5	Exception Handling: Principle of Exception handling, exception handling mechanism, multiple catch, nested try, rethrowing the exception. Streams in C++: Stream classes, formatted and unformatted data, manipulators, user defined manipulators, file streams, file pointer manipulation, file open and close. Templates: Template functions and Template classes.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Complete Reference of C++ by Herbert Schilde
2	Object Oriented Programming with C++ By E.Balaguruswamy

Reference Books:

1	Object Oriented Turbo C Plus Plus by Robert Lafore
2	Programming with C Plus Plus by D.RaviChandra

Course Code	Course Title	Lecture			
MMCA203PCT	Data Structures Using C	L	T	P	Semester: II
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To practice with programming skill and improve the programming logic.
2. To apply various techniques with data such storing, inserting, deleting and traversing of data.
3. To implement data structures such as Linked List Structures, Stack, Queues, Trees and Graphs.

Course Outcomes:

1. To write the code for a large program after overcoming the time and space complexity.
2. Frequent use of various algorithms such as searching, sorting, traversing with data structures.
3. Define the data in an optimal way

Detailed Contents:	
Unit: 1	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List .
Unit: 2	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, De-queue and Priority Queue.
Unit: 3	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.
Unit: 4	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.
Unit: 5	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort. Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, AVL trees, introduction to m-way Search Trees, B Trees & B+ Trees Hashing: Hash Function, Linear probing.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Data Structure, Lipschutz, Schaum's Outline Series, TMH.
2	Data Structures and Algorithms, G A V Pai, TMH.

Reference Books:

1	Data Structures Using C and C++, Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein PHI.
2	Fundamentals of Data Structures, Horowitz and Sahani, Galgotia Publication.

Course Code	Course Title	Lecture			
MMCA204PCT	Operating Systems	L	T	P	Semester: II
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand overall functionality of Operating System such as Process Management, Memory Management, File Management and Security Issue.
2. To Provide sufficient understanding of operating system design
3. To understand the impact of operating system on application systems design and performance.

Course Outcomes:

1. Exhibit familiarity with the fundamental concepts of operating systems.
2. Apply a mature understanding of operating system design and how it impacts application systems design and performance.
3. Exhibit competence in recognizing operating systems features and issues.

Detailed Contents:

Unit: 1	Introduction : Operating system and functions, Clasification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocesor Systems, Multiuser Systems, Multiproces Systems, Multihreaded Systems, PC systems; System Calls types, Operating System Structure, Operating System services, Kernel and its types.
Unit: 2	Concurent Proceses: Proces Concept, Principle of Concurency, Producer /Consumer Problem, Mutual Exclusion, Critcal Section Problem, Deker's solution, Peterson's solution, Semaphores, Test and Set peration; Clasical Problem in Concurency- Dining Philosopher Problem, Sleping Barber Problem; Inter Proces Communication models and Schemes, Process generation.
Unit: 3	CPU Scheduling: Scheduling Concepts, Performance Criteria, Proces States, Proces Transiton Diagram, Proces Control Block (PCB), Threads and their management, Scheduling Algorithms, Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock, banker's algorithm.
Unit: 4	Memory Management: Multiprogramming with fixed partitions, Multiprogramming with variable portitions, Protection schemes, Paging, Segmentation, Virtual memory concepts, Page replacement algorithms, Thrashing, File system Structure, File organization and aces mechanism,File directories, and File sharing, allocation methods, free space management, Directory implementation.
Unit: 5	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O bufering, Disk storage and disk scheduling, RAID. **UNIX:** Essential commands and utilities, Unix files, directory structure, file security, Bourne shell programming features, systems calls classification and basics, **Linux:** System components, Networking software layers.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. SibsankarHalder and Alex A Aravind, "Operating Systems", Pearson Education

Reference Books:

1. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
2. D M Dhamdhere, "Operating Systems :A Concept basedAproach", McGraw Hill.

Course Code	Course Title	Lecture			
MMCA201PET	Accounting and Financial Management	L	T	P	Semester: II
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Measure performance
2. To Allocation of Resources: is an important objective of Management Accounting.
3. To present of various financial statements to the Management.

Course Outcomes:

1. Explain the differences between management and financial accounting
2. Describe the main elements of financial accounting information – assets, liabilities, revenue and expenses
3. Identify the main financial statements and their purposes.

Detailed Contents:

Unit: 1	Overview: Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards.
Unit: 2	Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill.
Unit: 3	Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios ; Common Size Statement ; Comparative Balance Sheet and Trend Analysis of manufacturing, service & banking organizations.
Unit: 4	Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis; Cash Flow Statement: Various cash and noncash transactions, flow of cash, preparation of Cash Flow Statement and its analysis.
Unit: 5	Budgeting: budgets, purpose, budgetary control, preparation of budgets, master budget, fixed and flexible budgeting.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Narayanswami - Financial Accounting: A Managerial Perspective (PHI, 2nd Edition).
2. Mukherjee - Financial Accounting for Management (TMH, 1st Edition).

Reference Books:

1. Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).
2. Ghosh T P - Accounting and Finance for Managers (Taxman, 1st Edition)

Course Code	Course Title	Lecture			
MMCA202PET	Multimedia Applications	L	T	P	Semester: II
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To present a step-by-step approach to multimedia systems design & multimedia applications
2. To introduce multimedia standards, compression and decompression technologies
3. To provide a detailed analysis of the various storage technologies.

Course Outcomes:

1. Understand different realizations of multimedia tools and their usage.
2. Implement various multimedia standards and compression technologies
3. Understand and apply the current technologies of multimedia systems, multimedia standards, and gain hands-on experience in this area.

Detailed Contents:

Unit: 1	Multimedia Fundamentals: Define the concept of multimedia, fundamental criteria for the design of a multimedia presentation, multimedia application goals &objectives, opportunities in multimedia production, Role of multimedia development team members, avoiding problems in planning a multimedia application
Unit: 2	Multimedia Building Blocks: Text, Graphics, video capturing, Sound capturing, editing. Basic design principle: proximity, visual hierarchy, Symmetry / Asymmetry, Repetition, unity, Contrast, dynamics, Emphasis, Multimedia Authoring tools.
Unit: 3	Design, Development and evaluation of multimedia a system: The development of user interface design, Design Process
Unit: 4	Multimedia & the Internet, Multimedia conferencing, Multimedia file sharing, Multimedia broadcasting,
Unit: 5	Multimedia file handling: Compression & Decompression, Data & file formats standard.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. An introduction to Multimedia, John Villamil-Casanova, Louis Molina
2. Designing Interactive Multimedia Systems, Mohammad Dastbaz

Reference Books:

1. Multimedia Networking, Bohdan O. Szuprowicz
2. Multimedia on the Web, Stephen McGloughlin

Course Code	Course Title	Lecture			
MMCA203PET	Client Server Computing	L	T	P	Semester: II
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Understand the Functionality of Client and Server. How these are connected and working together.
2. To understand the database managing techniques and corresponding applications.
3. To be aware of the client server development process.

Course Outcomes:

1. Understand client server computing architecture and utilized tools.
2. Use the applications related client server computing.
3. Connect the client and server with the help of network topologies and related data base applications.

Detailed Contents:

Unit: 1	Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.
Unit: 2	Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.
Unit: 3	Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.
Unit: 4	Client Server Systems Development: Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues. Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training.
Unit: 5	Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors. The future of client server Computing Enabling Technologies, The transformational system.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Patrick Smith & Steave Guengerich, "Client / Server Computing", PHI
2. Dawna Travis Dewire, "Client/Server Computing", TMH

Reference Books:

1. Korth, Silberchatz, Sudarshan, "Database Concepts", McGraw Hill
2. Elmasri, Navathe, S.B, "Fundamentals of Data Base System", Addison Wesley

Course Code	Course Title	Lecture			
MMCA204PET	Soft Computing	L	T	P	Semester: II
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Familiarize with soft computing techniques and basic concepts.
2. To Provide the basic concepts of different methods and tools for processing of uncertainty in intelligent systems, such as, fuzzy models, neural networks, probabilistic models, and foundations of its using in real systems.
3. To Introduce and use the idea of Neural networks, fuzzy logic and use of heuristics based on human experience.

Course Outcomes:

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Recognize the feasibility of applying a soft computing methodology for a particular problem
3. Apply fuzzy logic and reasoning to handle uncertainty

Detailed Contents:

Unit: 1	Fuzzy set theory :Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.
Unit: 2	Optimization: Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.
Unit: 3	Neural networks**:** Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.
Unit: 4	Neuro fuzzy modeling: Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.
Unit: 5	Applications of computational intelligence: Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Neuro-Fuzzy and Soft Computing, J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms, S. Rajasekaran and G.A.V.Pai, PHI, 2003

Reference Books:

1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, McGraw-Hill, 1997.
2. Genetic Algorithms: Search, Optimization and Machine Learning, Davis E.Goldberg, Addison Wesley, N.Y., 1989.

Course Code	Course Title	Lecture			
MMCA205PET	Information Security and Cyber Laws	L	T	P	Semester: II
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

4. Learn about security management and cyber law.
5. Familiarize principle of information security.
6. Know about Security Architecture and its models and cryptographic algorithms.

Course Outcomes:

4. Understand the constraints of cyber law and security concern.
5. Understand the importance of information security and how can manage the security of network as well as data.
6. Know the working of security models and applied algorithms.

Detailed Contents:	
Unit: 1	Information Security Context and CBK: Introduction, Growing IT Security Importance and New Opportunities, Increasing Demand by Government and Private Industry; Becoming an IS specialist; Multidisciplinary Approach; contextualizing Information Security; IS Expertise & Business Systems. Security Management Practices: Security Architecture and Models; BCP; LAW, Investigations and Ethics, Physical Security; Operation Security; ACM Systems and Methodology; Cryptography; Telecommunications, Network and Internet Security; and Application Development Security.
Unit: 2	Information Security Principles: Absolute Security; Three Security Goals; DID as Strategy;When Left on Their Own; Security Requirements; Security Through Obscurity Is Not an Answer; Security = Risk Management; Three Types of Security Controls; Complexity Is the Enemy of Security; Fear, Uncertainty, and Doubt; People, process and Technology; and Open Disclosure of Vulnerabilities.
Unit: 3	Security Management and BC-DRP: Security policies, programme–level, programme-framework, Issue-specific and system-specific policies; Development and Management of Security Policies: Security Objectives, Operational Security and Policy Implementation; Policy Support Documents Regulations; Standards Taxonomy; Risk Analysis and Management; Responsible for security? Business Continuity plan; Disaster Recovery planning: Identifying Recovery Strategies, Shared-site Agreements, Alternates sites, Additional Agreements, Testing DRP.
Unit: 4	Security Architecture and Models: Defining TCB: Rings of Trust; Protection Mechanismsin a TCB: System Security Assurance concepts, Goals of Security Testing and Formal Security Testing Models; TCSE: Minimal, Discretionary, Mandatory and Verified Protection; Trusted Network Interpretation and TCSEC; Comparing ITSEC and TCSES & ITSEC; CTCPEC, FCITS; CI Models: Bell – Lapadula Model, Biba Integrity Model and Advanced Models; PPO, SFR,EAL and the CEL.
Unit: 5	Cryptography:Cryptography Needs and significance, Terms and Concepts: Cyphertext,Cryptanalysis, Cryptosystem, Message Digest etc; STE and Substitution ; Digesting Data; Digital Certificates, Certification and Envelop; symmetric and Symmetric Cryptography; Root, Private and Public; Digital Cryptography – Hashing Functions, Block Ciphers and Implementation of PPK Cryptography. Operations Security and Access Control Systems: Operations Security Principles; Operations Security Process Controls; Operations Security Controls in Action; Information Owner, Discretionary Access Control, ACL, MAC, RAC; Principles of Authentication: The Problems with Passwords, Multifactor Authentication.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Neuro-Fuzzy and Soft Computing, J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education. Godbole, Information Systems Security, Willey.
2	Merkov, Breithaupt," Information Security", Pearson Education.
Reference Books:	
1	Sood,"Cyber Laws Simplified", Mc Graw Hill.
2	Furnell, "Computer Insecurity", Springer.

Course Code	Course Title	Lecture			
MMCA250PCP	OOPS Using C++ Lab	L	T	P	Semester: II
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. Use objects and classes for write the code of some real life problems.
2. Understand the utility of Object, Class, Abstraction, Inheritance, Polymorphism, Aggregation and Generalization techniques in C++.
3. Concept of Constructor, Destructor, friend function, virtual function, Exception handling, etc.

Course Outcomes:

1. Create object in a class and its utilization.
2. Optimize the programming code with the help of Object oriented approach such as Abstraction, Inheritance and Polymorphism etc.
3. Before writing the code can design class diagram to understand the flow of data and instructions.

Detailed Contents:

1. Inline Function.
2. Function Overloading.
3. Programs on Classes.
4. Constructors, Destructors
5. Static Members.
6. Friend Function, Friend Class
7. Dynamic Memory Allocation using new and delete.
8. Pointer to object.
9. Overloading unary operator, Overloading binary Operators
10. Overloading binary operators using Friend function.
11. Single and Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance.
12. Constructors and Destructors in derived classes.
13. Virtual Function.
14. Programs on file handling using classes.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	
2	
Reference Books:	
1	
2	

Course Code	Course Title	Lecture			
MMCA251PCP	Data structures Using C Lab	**L**	**T**	**P**	**Semester:** II
Version:	**Date of Approval:**	0	0	4	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. To practice with programming skill and improve the programming logic.
2. To apply various techniques with data such storing, inserting, deleting and traversing of data.
3. Utilization of various data structures such as Linked List Structures, Stack, Queues, Trees and Graphs.

Course Outcomes:

1. Write the code for a large program after overcoming the time and space complexity.
2. Frequent use of various algorithms such as searching, sorting, traversing with data structures.
3. Define the data in an optimal way.

Detailed Contents:

1. Write a Programme to implement a stack using array.
2. Write a Programme to implement a stack using linked list
3. Write a Programme to implement a queue using array.
4. Write a Programme to implement a queue using linked list
5. Write a Programme to implement a circular queue using array
6. Write a Programme to implement a simple linked list
7. Write a Programme to implement a circular linked list
8. Write a Programme to implement a doubly linked list
9. Write a Programme to count a node in linked list
10. Write a Programme to implement a reversed a linked list
11. Write a Programme to implement a quick sort.
12. Write a Programme to implement a merge sort.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	
2	
Reference Books:	
1	
2	

Course Code	Course Title	Lecture			
MMCA301PCT	Data Base Management System	L	T	P	Semester: III
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Provide for mass storage of relevant data.
2. To make access to the data easy for the user.
3. To provide prompt response to user requests for data and Make the latest modifications to the database available immediately.

Course Outcomes:

1. Take an English language description and convert it into a working database application.
2. Create E/R models from application descriptions.
3. Create databases in an RDBMS and enforce data integrity constraints using SQL and database queries using SQL.

Detailed Contents:

Unit: 1	Introduction to Database Systems: Overview – Data Models – Database System Architecture – History of Database Systems. Entity-Relationship Model: Basic Concepts – Constraints – Keys – Design Issues – Entity Relationship Diagram – Weak Entity Sets – Extended E-R Features – Design of an E-R Database Schema – Reduction of E-R Schema to Tables.
Unit: 2	Relational Model: Structure of Relational Databases – Relational Algebra – Extended Relational Algebra Operations – Modification of Database – Views – Tuple Relational Calculus – Domain Relational Calculus. SQL: Background – Basic Structure – Set Operations – Aggregate Functions – Null Values – Nested Subqueries – Views – Complex Queries – Modification of the database – Joined Relations – Data-Definition Language – Embedded SQL –Dynamic SQL – Other SQL Features. Other Relational Languages.
Unit: 3	Integrity and Security: Domain Constraints – Referential Integrity – Assertions – Triggers – Security and Authorization – Authorization in SQL – Encryption and Authentication. Relational-Database Design(Text Book sl.no:02): First Normal Form – Second normal form- Boyce-Codd Normal Form – Third Normal Form – Fourth Normal Form.
Unit: 4	Storage and File Structures: Overview of Physical Storage Media – Magnetic Disks – RAID – Tertiary Storage – Storage Access – File Organization – Organization of Records in Files – Data-Dictionary Storage. Indexing and Hashing: Basic Concepts – Ordered Indices – B+-Tree Index Files – B-Tree Index Files – Static Hashing – Dynamic Hashing Index Definition in SQL – Multiple-Key Access.
Unit: 5	Transactions: Transaction concept – Transaction State – Implementation of Atomicity and Durability – Concurrent Executions – Serializability – Recoverability – Implementation of Isolation – Transaction Definition in SQL – Testing for Serializability Concurrency Control: Lock-Based Protocols – Timestamp-Based Protocols – Validation-Based Protocols – Multiple Granularity– Deadlock Handling – Insert and Delete Operations. Recovery System: Failure Classification – Storage Structure – Recovery and Atomicity – Log-Based Recovery.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Silberschatz, Korth, Sudarshan, Database System Concepts, McGraw-Hill, 4th Edition – 2002.
2	Modern Database Management, Fred R.MC.Fadden, Jeffrey A.Hoffer and Mary B.Prescott, Prentice Hall.

Reference Books:

1	Fred R McFadden, Jeffery A Hoffer, Mary B. Prescott, "Moden Database Management:, Fifth Edition, Addison Wesley, 2000.
2	Elmasri, Navathe, "Fundamentals of database Systems", Third Edition, Addison Wesley, 2000.

Course Code	Course Title	Lecture			
MMCA302PCT	Analysis & Design of Algorithms	L	T	P	Semester: III
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To introduce design of algorithms as a means of problem-solving.
2. To analyze the complexity of algorithms.
3. To learn the limits of algorithms

Course Outcomes:

1. Demonstrate the worst-case time complexity of an algorithm is defined;
   Compare the efficiency of algorithms using asymptotic complexity;
2. Design efficient algorithms using standard algorithm design techniques.
3. Demonstrate a number of standard algorithms for problems in fundamental areas in computer science and engineering such as sorting, searching, and problems involving graphs.

Detailed Contents:

Unit: 1	Introduction: Algorithm – pseudo code for expressing algorithms – analysis – time complexity and space complexity – efficiency of algorithms – O-notation – Omega notation and Theta notation. Divide and conquer: General method – binary search – merge sort – quick sort.
Unit: 2	Greedy method: General method- Knapsack problem – job sequencing with deadlines minimum-cost spanning trees: Prim's and Kruskal's algorithms – Single source shortest paths : Dijkstra's algorithm.
Unit: 3	Dynamic programming: General method – Multistage Graphs – All pairs shortest paths, Single source shortest paths – optimal binary search trees – O/1 Knapsack problem – Traveling sales person problem.
Unit: 4	Back tracking: General method – n-queen problem – sum of subsets problem – graph colouring – Hamiltonian cycles.
Unit: 5	Branch and bound: Least Cost (LC) search, Bounding – LC branch and bound – FIFO branch and bound – Travelling sales person problem.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Fundamentals of computer algorithms, E. Howrowitz and Sahni, Galgotia Publications, 1998.
2. Algorithms, Coreman, Rivest, Lisserson, PHI, Third Edition

Reference Books:

1. Computer Algorithms: Introduction to Design & Analysis, Basse, Addision Wesley.
2. Fundamentals of Algorithm, Gilles Brassard and Paul Bratley, Prentice Hall of India, 1997

Course Code	Course Title	Lecture			
MMCA303PCT	Computer Networks	L	T	P	Semester: III
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand the computer networks and concentrates on building a firm foundation
2. To provide the fundamental knowledge of the various aspects of computer networking
3. To appreciate recent developments in the area.

Course Outcomes:

1. Have a good understanding of the OSI Reference Model and TCP/IP Model and in particular have a good knowledge of Layers.
2. Analyse the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
3. Have a basic knowledge of the use of cryptography and network security.

Detailed Contents:

Unit: 1	Introduction To Networks And Communication Media: Uses – Network Hardware – Network Software – Reference Models – Example Networks – Network Standardization. Basis for data communication - Transmission media – Wireless Transmission – Telephone Systems – Satellite Communication.
Unit: 2	Physical Layer **:** Bit Rate, Data rate, Frequency, Bandwidth, Baud Rate, Harmonics, Maximum data rate of a channel. The Data Link Layer **:** Data Link Layer design issues – Error Detection and Correction Methods - Elementary Data Link Protocols – Sliding Window Protocols – Protocol Verification Methods – Channel Allocation – Multiple Access protocols – IEEE 802 Standards.
Unit: 3	The Network Layer: Network Layer design issues – Routing algorithms – Congestion Control algorithms – Internetworking – Network Layer in Internet.
Unit: 4	The Transport Protocols: Transport Service – Transport Protocols – Internet Transport Protocols UDP – TCP - Performance issues.
Unit: 5	The Application Layer: Application Layer design issues – Domain Name System - Electronic Mail – World Wide Web – Multimedia - Other Applications – Network Security - Basic Cryptography

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Andrews S. Tanenbaum, "Computer Networks", Prentice Hall of India Private Limited, (4th Edition), 2003.
2. Leon Garcia and Widjaja, "Communication Networks - Fundamental concepts and key architecture", Tata McGraw Hill, 2001

Reference Books:

1. Internetworking with TCP/IP Volume 1: Principles Protocols, and Architecture, Douglas Comer and Prentice Hall, fifth edition, 2006.
2. Network Protocols: Signature Edition, Matthew G. Naugle. Mcgraw-Hill Signature Series

Course Code	Course Title	Lecture			
MMCA304PCT	Java Programming	L	T	P	Semester: III
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To introduces computer programming using the JAVA programming language with object-oriented programming principles.
2. To emphasize on event-driven programming methods, including creating.
3. To manipulate objects, classes, and using object-oriented tools such as the class debugger.

Course Outcomes:

1. Design, create, build, and debug Java applications and applets.
2. Write Java programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, inheritance, and polymorphism.
3. Write programs using graphical user interface (GUI) components and Java's Event Handling Model.

Detailed Contents:

Unit: 1	Java Basics **-** Review of OOP concepts, History of Java, Java buzzwords, comments, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow-block scope, conditional statements, loops, break and continue statements, simple java program, arrays, input and output, formatting output, encapsulation, inheritance, polymorphism, classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this keyword, overloading methods and constructors, recursion, garbage collection, String Handling, Enumerations.
Unit: 2	Inheritance – Inheritance concept, benefits of inheritance ,Super classes and Sub classes, Member access rules, Inheritance hierarchies, super keyword, preventing inheritance: final classes and methods, casting, polymorphism - dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.
Unit: 3	Interfaces – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface. **Inner classes** – Uses of inner classes, local inner classes, anonymous inner classes, static inner classes. **Packages-**Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.
Unit: 4	Exception handling – Dealing with errors, benefits of exception handling, the classification of exceptions-exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally , re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes, Guide lines for proper use of exceptions. **Multi-**threading **-** Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, thread groups, daemon threads.
Unit: 5	Applets, java gui and database connectivity, **Networking** - Applets – Applet life cycle methods – Applets based GUI – AWT Introduction - GUI components – Basics of Swings – Accessing database with JDBC basics- Types of Drivers – Basics of Network Programming, Addresses, Ports, Sockets, Simple Client and Server Program, Multiple Clients and Single Server.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	E.Balaguruswamy, Programming with Java, A primer, 3e, TATA McGraw-Hill Company (2008).(Chapters : 1 to 14)
2	Robert Lafore, Data Structures & Algorithms in Java, Second Edition, Pearson Education(2008).

Reference Books:

1	John R. Hubbard, Programming with Java, Second Edition, Schaum's outline Series, Tata McGrawhill (2007).
2	Timothy Budd, Understanding Object Oriented Programming with Java, Pearson Education (2007).

Course Code	Course Title	Lecture			
MMCA301PET	Mobile Computing	**L**	**T**	**P**	Semester: III
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand data communications, resource management, network protocols, distributed computing, information management, user interfaces, applications/services, and security.
2. To learn the principles of Mobile Computing and its enabling technologies,
3. To explore a young but rich body of exciting ideas, solutions, and paradigm shifts.

Course Outcomes:

1. Understand the characteristics and limitations of mobile hardware devices including their user-interface modalities.
2. Develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.
3. Design and development of context-aware solutions for mobile devices

Detailed Contents:

Unit: 1	Introduction: PCS Architecture, Cellular Telephony, Cordless Telephony and Low-Tier PCS, Handoff, Roaming Management under SS7, Strategies for Handoff Detection, Channel Assignment, IS-41 Networking Signaling.
Unit: 2	GSM System overview, GSM Architecture, Location Tracking and call setup, GSM Network signaling, GSM Mobility management, GSM location update, failure restoration.
Unit: 3	SMS Architecture, SMS Protocol Hierarchy, Mobile-Originated Message, Mobile Terminated Message, DTE-DCE-Interface.
Unit: 4	Mobile Number Portability, fixed network number portability, mobile number portability mechanism.
Unit: 5	GPRS, Wireless Access Protocol (WAP), 3G Mobile Services, W-CDMS and cdma2000, QoS in 3G, Wireless Local Loop (WLL), Wireless Enterprise Network.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Yi-Bing Lin & Imrich Chlamtac, "Wireless and Mobile Networks Architectures", John Wiley & Sons, 2001.
2. Raj Pandya, "Mobileand Personal Communication systems and services", Prentice Hall of India, 2001

Reference Books:

1. Hansmann, "Principles of Mobile Computing", Wiley Dreamtech, 2004.
2. Mark Ciampa, "Guide to Designing and Implementing wireless LANs", Thomson learning, Vikas Publishing House, 2001.

Course Code	Course Title	Lecture			
MMCA302PET	Advance Operating System	L	T	P	Semester: III
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand advanced operating system topics
2. To exposed the recent developments in operating systems research.
3. To understand the operating system design, virtual memory management, virtual machines, OS interaction with the hardware architecture, synchronization and communication, file systems, protection, and security

Course Outcomes:

1. Understanding of design issues associated with operating systems
2. Understand issues related to file system interface and implementation, disk management
3. Understand familiar with protection and security mechanisms

Detailed Contents:	
Unit: 1	Process Synchronization**:** Concepts of processes, Concurrent processes, Threads, Overview of different classical synchronization problems, Monitors, Communicating Sequential processes (CSP). Process deadlocks: Introduction, causes of deadlocks, Deadlock handling strategies, Models of deadlock.
Unit: 2	Distributed operating system: Architectures, Issues in Distributed operating systems, Limitations of Distributed Systems, Lamport's logical clock, Global states, Chandy-Lampert's global state recording algorithm,Basic concepts of Distributed Mutual Exclusion ,Lamport's Algorithm, Ricart -Agrawala Algorithm;Basic concepts of Distributed deadlock detection, Distributed File system, Architecture, Design issues, SUN Network File system. Basic concepts of Distributed shared memory, Basic concepts of Distrubuted Scheduling, Load balancing, Load sharing.
Unit: 3	Distributed OS Implementation**:** Models, Naming, Process migration, Remote Procedure Calls. Multiprocessor System: Motivation, Classification, Multiprocessor Interconnections, Types, Multiprocessor OS functions & requirements; Design & Implementation Issue; Introduction to parallel programming; Multiprocessor Synchronization.
Unit: 4	Performance, Coprocessors, RISC & data flow: Introduction, Necessity, Measures, Techniques, Bottlenecks & Saturation, Feedback loops, Coprocessors, RISC. Analytic Modeling: Introductions, Queing Theory, Markov Process.
Unit: 5	Security & Protection: Security-threats & goals, Penetration attempts, Security Policies & mechanisms, Authentication, Protections & access control Formal models of protection, Cryptography, worms & viruses.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Operating Systems Concepts & design - Milan Milenkovic, TMH.
2. Advanced Concepts in operating Systems - Mukesh Singhal and Niranjan G. Shivaratri, TMH**.**

Reference Books:

1. A. Silberschatz - Applied Operating System Concepts, Wiley, 2000.
2. Lubemir F Bic and Alan C. Shaw - Operating System Principles, Pearson Education, 2003.

Course Code	Course Title	Lecture			
MMCA303PET	Component Based Software Engineering	L	T	P	Semester: III
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand the technical issues in large-scale software reuse and component-based software engineering.
2. To understand the architecture of component based software engineering.
3. To understand the design for reuse, domain engineering, model-driven development, domain-specific kits, components, frameworks, software agents, generators, problem-oriented languages, library design, reuse tools, patterns, and aspects of component based software engineering.

Course Outcomes:

1. List the basic CBSE Standards and structures, List the concept of CBSE Process, and main models, Demonstrate knowledge of technologies and standards for component-based software, List advanced concepts of CBSE modelling, analysis, prototyping, etc., List the concept of Quality of CBSE.
2. Analyze and compare different CBSE models.
3. Implement solutions of a range of software tools in support of the CBS, Implement solutions using web service examples, Grasp knowledge of UML notation: to give the ability to produce UML documentation, writing standards in CBS

Detailed Contents:

Unit: 1	Introduction to CBSE:Component-Based Software Engineering (CBSE), CBSE vs. Object-Oriented Software Engineering, CBSE methodology, CBSE processes, domain engineering, component engineering, component-based software life cycle, component vs. object, CBSE project management, measurement and metrics for CBSE, challenge CBSE, advantages and disadvantages of CBSE, economics of CBSE.
Unit: 2	Component-oriented programming:Component-oriented programming, object-oriented programming to component-oriented programming, component-oriented programming vs. object-oriented programming, principle and infrastructure of component-oriented programming.
Unit: 3	Component and component model:Component, component technology, software component, specification of software component, component architecture, component framework, component interface, component abstraction, component services, components model, component selection, component adaptability, component certification, component composition, component and interface modeling, domain modeling, patterns and frameworks.
Unit: 4	Component-based design and reuse:Principles of component design and reuse, design prototyping, design production, design refactoring, design documentation, component-based software reuse, reusable component, component-based reuse metrics.
Unit: 5	**Component technologies:** Component technologies: Component Object Model (COM), Distributed Component Object Model (DCOM), Common Object Requesting Broker Architecture (CORBA), Enterprise Java Beans (EJB) .

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. George T. Heineman, William T. Councill, Component-Based Software Engineering: Putting the Pieces Together, Addision Wesley, 2001.
2. Andy Ju An Wang, Kai Qian, Component-Oriented Programming, Willey Interscience, 2005

Reference Books:

1. Clemens Szyperski, Component Software: Beyond Object-Oriented Programming, Addison Wesley, 1997.
2. Alan W. Brown, Component-Based Software Engineering, Wiley-IEEE Computer Society, 1996

Course Code	Course Title	Lecture			
MMCA304PET	Information Retrieval Systems	L	T	P	Semester: III
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. The domain of Information Retrieval is concerned with the extraction of relevant information from large collections of documents.
2. It has applications to proprietary retrieval systems as well as the WWW, Digital Libraries and commercial recommendation systems.
3. This course will aim to provide students with an overview of the main principles and methods underlying the domain of Information Retrieval.

Course Outcomes:

1. Use different information retrieval techniques in various application areas.
2. Apply IR principles to locate relevant information large collections of data.
3. Analyze performance of retrieval systems when dealing with unmanaged data sources

Detailed Contents:	
Unit: 1	Information Storage and Retrieval (IR) Systems: Concept, components, IR tools. Information Analysis, repackaging and consolidation: Concept, purpose. Content Creation / Content Development. Indexing: Concept. Principles / general theory of indexing. Content Analysis: Meaning, Purpose. Application in LICs.
Unit: 2	Indexing Languages, types, Characteristics. Vocabulary control – natural and controlled languages. Semantics and Syntax. Library Classification Schemes: UDC and CC. Thesaurus – Structure and functions. Design / Construction of Thesaurus. Subject Headings – LCSH and SLSH – Structure and Functions.
Unit: 3	Indexing Techniques: Syntactical problems. Pre and post-coordinate indexing. Chain Indexing, PRECIS. Uniterm, Keyword and Citation Indexing. Computer based indexing systems and methods (Automatic Indexing).
Unit: 4	Bibliographic Description: Standards for bibliographic Description: ISBDs, MARC, CCF and MARC 21. METADATA: Concept, Formats – Features of MARC, IAFA, Templates, Dublin Core, TELURC, FGDC --- Detailed Study of any two formats. Protocols – Features – SODA, SMARTS. Metadata vis-à-vis Internet. DIGITAL OBJECT IDENTIFIER (DOI): Concept, Origin, application, principles for issuance of DOI. Principles for the application of DOI. DOI Foundation, procedure for registration.
Unit: 5	Information Retrieval: Retrieval methods – manual and automated. Search processes, and strategies. Boolean Logic. Preparation of query, steps in search strategy. Search tools – search engines, meta-search engines. Subject directories, subject guides, specialized data bases, etc.,. Criteria for evaluation of IR Systems. Computerized Information Services: Machine Translation. Automatic Indexing. Computerized Abstracting. Natural Language Processing.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	Unesco. CCF. Paris : Unesco. 1988
2	Jean Atchison & Alan Gilchrist. Thesaurus construction: a practical manual. London: Aslib. 1972
Reference Books:	
1	A. C. Foskett. The subject approach to information. 4th ed. London : Bingley, 1982.
2	F. Wilfrid Lancaster. Information retrieval systems: Characteristics, testing and evaluation. 2nd ed. New York: Wiley, 1979.

Course Code	Course Title	Lecture			Semester: III
MMCA350PCP	DBMS LAB	L	T	P	
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. Knowledge of DBMS, in terms of use and implementations.
2. Understand the concept of data planning and database design for serving different types of users with varying skill levels.
3. Handling different user views of the same stored data, combining interrelated data , setting standards, controlling concurrent updates so as to maintain data integrity.

Course Outcomes:

1. Understand the relational database theory, and be able to write relational algebra expressions for queries, logical design of databases, including the E-R method and normalization approach.
2. Illustrate commercial relational database system by writing SQL.
3. Understand and analyze the database storage structures and access techniques like file and page organizations, indexing methods including B-tree, hashing, query evaluation techniques and and query optimization.

Detailed Contents:

1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using logical operations (=, <,>, etc.)
3. Write SQL queries using SQL operators
4. Write SQL query using character, number, date and group functions
5. Write SQL queries for relational algebra
6. Write SQL queries for extracting data from more than one table
7. Write SQL queries for sub queries, nested queries
8. Write programme by the use of PL/SQL
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS
10. Create VIEWS, CURSORS and TRIGGERS & write ASSERTIONS.
11. Create FORMS and REPORTS

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	
2	
Reference Books:	
1	
2	

Course Code	Course Title	Lecture			Semester: III
MMCA351PCP	Java Programming Lab	L	T	P	
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. To write programs using abstract classes.
2. To write programs for solving real world problems using java collection frame work.
3. To write multithreaded programs.

Course Outcomes:

1. Able to write programs for solving real world problems using java collection framework.
2. Able to write programs using abstract classes.
3. Able to write multithreaded programs.

Detailed Contents:

1. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
2. A) Develop an applet in Java that displays a simple message.
   b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.
3. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
4. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color. Initially, there is no message shown.
5. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
6. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
7. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
8. Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.
9. Write a Java program to list all the files in a directory including the files present in all its subdirectories.
10. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	
2	
Reference Books:	
1	
2	

Course Code	Course Title	Lecture			
MMCA401PCT	Software Engineering	L	T	P	Semester: IV
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand the software development process.
2. To understand the Software design techniques for developing large software systems.
3. To understand the CASE tools and software development environments.

Course Outcomes:

1. Understands the process tube followed in the software development life cycle
   Find practical solutions to the problems
2. solve specific problems alone or in teams
3. manage a project from beginning to end

Detailed Contents:	
Unit: 1	Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC), Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.
Unit: 2	Software Requirement Specifications (SRS):Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.
Unit: 3	Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.
Unit: 4	Software Testing Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing,Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.
Unit: 5	Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.
Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.	

Text Books:	
1	R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2	Rajib Mall, Fundamentals of Software Engineering, PHI Publication
Reference Books:	
1	K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
2	Pankaj Jalote, Software Engineering, Wiley

Course Code	Course Title	Lecture			
MMCA402PCT	Data Warehousing and Data Mining	**L**	**T**	**P**	**Semester:** IV
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To provide you with the basic information about data ware house and their development.
2. To provides the basic conceptual background necessary
3. To design and develop data ware house applications

Course Outcomes:

1. Discuss the role of data warehousing and enterprise intelligence in industry and government.
2. Summaries the dominant data warehousing architectures and their support for quality attributes.
3. Recognize and describe at least three computational approaches to data clustering, taking cognizance of the contribution of paradigms from the fields of Artificial Intelligence and Machine learning.

Detailed Contents:

Unit: 1	Introduction: What is Data Mining, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining. Data Preprocessing: Needs Preprocessing, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.
Unit: 2	Data Warehouse and OLAP Technology: What is Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture and Implementation, from Data Warehousing to Data Mining.Mining Frequent Patterns, Associations Rules: Basic Concepts, Efficient and Scalable Frequent Item Set Mining Methods, Mining Variouskinds of Association Rules.
Unit: 3	Classification and Prediction: Introduction, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rulebased Classification, Classification by Back Propagation, Support Vector Machines, Prediction, Accuracy and Error Measures.
Unit: 4	Cluster Analysis: Introduction, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model Based Clustering Methods, Outlier Analysis.
Unit: 5	Mining Object, Spatial, Multimedia, Text, and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Han J &KamberM, "Data Mining: Concepts and Techniques", Harcourt India, Elsevier India, Second Edition.
2. Pang-NingTan. MichaelSteinback,VipinKumar, "Introduction to Data Mining", Pearson Education, 2008

Reference Books:

1. Margaret H Dunham,S.Sridhar, "Data mining: Introductory and Advanced Topics", Pearson Education, 2008.
2. Humphires,hawkins,Dy, "Data Warehousing: Architecture and Implementation", Pearson Education, 2009.

Course Code	Course Title	Lecture			
MMCA403PCT	Formal Language & Automata Theory	L	T	P	Semester: IV
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand the extensive and theoretical treatment of issues in Computability
2. To understand the extensive and theoretical treatment of issues in Complexity;
3. Understand the concept of Automata and Language Theory, Computability Theory, and Complexity Theory.

Course Outcomes:

1. Understand what can be computed and how fast it can be done?
2. Understand the Use of Automata
3. Use of Language theory in the development of different modules of a compiler as a case study.

Detailed Contents:

Unit: 1	Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.
Unit: 2	Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.
Unit: 3	Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages –Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG– Deterministic Pushdown Automata.
Unit: 4	Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.
Unit: 5	A language that is not Recursively Enumerable (RE) – An undecidable problem that is RE – Undecidable problems about Turing Machine – Post's Correspondence Problem –The classes P and NP.1. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", second Edition, Pearson Education, 2007.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Introduction to Automata Theory, Languages, and Computation, John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson, Third Edition.
2	Theory of Computer Science, K L P Mishra and N Chandrasekaran, PHI, Third Edition, 2007.

Reference Books:

1	H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education, 2003.
2	Thomas A. Sudkamp," An Introduction to the Theory of Computer Science

Course Code	Course Title	Lecture			
MMCA404PCT	Computer Graphics	L	T	P	Semester: IV
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To introduce the programming principles of computer graphics.
2. To understand the Practical programming through C
3. To implement the mathematical and theoretical foundations.

Course Outcomes:

1. Create interactive graphics applications in C++ using one or more graphics application programming interfaces.
2. Write programs that demonstrate computer graphics animation.
3. Write programs that demonstrate 2D image processing techniques.

Detailed Contents:	
Unit: 1	Overview of Graphics Systems – Video display devices, raster-scan systems. Random–scan system, graphics monitors and workstations. Input devices, Hardcopy devices, Graphicssoftware.Output primitives: Line drawing algorithms, Circle generation algorithms, ellipse generating algorithms, pixel addressing, Filled area primitives, Fill area functions, cell array, character generations.
Unit: 2	Attributes of output primitives: Line attributes, curve attributes color and Gray-scale level, Areafill attributes, character attributes, and Bundled attributes Enquiry functions. Two dimensional Geometric transformations: Basic transformations, Homogenous co-ordinates, affine transformations, transformation functions. Raster methods for transformations.
Unit: 3	Two dimensional viewing: Viewing pipeline, viewing transformation, viewing functions, lineclipping – Cohen Sutherland line clipping, Liang Barsky line clipping, polygon clipping: Sutherland – Hodgman polygon clipping, WilerAthertion polygon clipping.
Unit: 4	Structures and Hierarchical Modeling: Structure concepts, editing structures, Basic modelingconcepts, hierarchical modeling with structures. Graphical user interfaces and Interactive input methods: The user Dialogue, logical classification of input devices, Input functions and Models Interactive picture construction techniques.
Unit: 5	Three Dimensional object representations: Polysurfaces curved lines and surfaces, splinerepresentation, Bezier curves and surfaces, B-Spline curves and surface, CSG Methods: Octrees, BSP Trees.Three Dimensional Transformation : Three dimensional viewing: Viewing coordinates, projections, Visible surface detection methods: Back-face Detection, Depth-buffer methods, scanline methods, Depth-sorting methods, BSP – Tree Methods, Arc sub division methods, Basic illuminations models – Gourand shading phong shading.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Heanry Donald, Pauline Baker M: Computer Graphics, PHI, 2nd edn, 1995
2	

Reference Books:

1	Computer Graphics with Open GL
2	Harrington S: Computer Graphics A Programming Approach 2nd Edn. McGraw Hill

Course Code	Course Title	Lecture			
MMCA401PET	Distributed System	L	T	P	Semester: IV
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Understand the concept of distributed system
2. To Gain an understanding of the principles and techniques behind the design of distributed systems, such as locking, concurrency, scheduling, and communication across networks.
3. To Gain the practical experience in designing, implementing, and debugging real distributed systems.

Course Outcomes:

1. Identify the core concepts of distributed systems:
2. Examine how existing systems have applied the concepts of distributed systems in designing large systems.
3. Apply distributed concepts to develop sample systems.

Detailed Contents:

Unit: 1	Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.
Unit: 2	Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.
Unit: 3	Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.
Unit: 4	Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.
Unit: 5	Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill

Reference Books:

1. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education.
2. Tenanuanbaum, Steen," Distributed Systems", PHI

Course Code	Course Title	Lecture			
MMCA402PET	Software Testing and Quality Assurance	L	T	P	Semester: IV
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Study the state-of-the-art and main research challenges of selected topics in software testing
2. To Study the state-of-the-art and main research challenges of selected topics in software quality assurance.
3. To Introduce various approaches, techniques, technologies, and methodologies used in software testing and quality assurance

Course Outcomes:

1. Apply software testing knowledge and engineering methods.
2. Analyze different approaches to software testing and quality assurance, and select optimal solutions for different situations and projects;
3. Evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of ethics.

Detailed Contents:

Unit: 1	Introduction: Software Quality, Role of testing, v & v, objectives and issues of testing, Testing activities and levels, Sources of Information for Test Case Selection, White-Box and Black-Box Testing , Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization and Management. Unit Testing: Concept, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging.
Unit: 2	Control Flow & Data Flow Testing: Outline of CFT, CF Graph, and Paths in a Control Flow Graph, Path Selection Criteria, Generating Test Input, and Examples of Test Data Selection. Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Testing Criteria, Comparison of Testing Techniques.
Unit: 3	System Integration Testing & Test Design: Concept of Integration Testing, Different Types of Interfaces and Interface Errors, Granularity of System Integration Testing, System Integration Techniques, Test Plan for System Integration, Off-the-Shelf Component Testing, System Test Categories.
Unit: 4	System Test Planning, Automation & Execution: Structure of a System Test Plan, Test Approach, Test Suite Structure, Test Environment, Test Execution Strategy, Test Effort Estimation, Scheduling and Test Milestones, System Test Automation, Selection of Test Automation Tools, Test Selection Guidelines for Automation, Structure of an Automated Test Case, Test Automation Infrastructure Metrics for Tracking System Test, Metrics for Monitoring Test Execution, Beta Testing, System Test Report, Measuring Test Effectiveness. Acceptance Testing:
Unit: 5	Software Quality: Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Software Testing and Quality Assurance theory and practice byKshiraSagar Naik and Priyadarshi Tripathy.

Reference Books:

1	Stephen H.Khan, Metrics and Models in Software Quality Engineering Pearson Education,India.
2	Shari Lawrence Pfleeger,"Software Engineering Theory and Practice Pearson Education,India

Course Code	Course Title	Lecture			
MMCA403PET	Software Project Management	L	T	P	Semester: IV
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To introduce concepts that are seen as central to the effective management of software projects
2. To develop the concepts that is seen as central to the effective management of software projects.
3. To Understand the Basic measurements with examples from real-world projects, which show how a project can be monitored, controlled and assessed?

Course Outcomes:

1. Examine the fundamentals of the software project and the factors involved in using a methodology in the context of project management.
2. Explain the risks, issues, and critical success factors associated with technology projects and software projects in particular.
3. Create a project plan, including scope definition, risk assessment, task breakdown, team selection, estimates, communication mechanisms and progress evaluation and reporting using an appropriate project lifecycle.

Detailed Contents:

Unit: 1	Introduction: Project Management concepts, Process Framework, Project Planning Software Life Cycle Models, Artifacts of the Project Management Process.
Unit: 2	Cost and Scheduling Estimation Models: Various Levels of COCOMO for Cost, Effort, Schedule and Productivity Estimation. Approaches to Effort, Cost Estimation, and Schedule Estimation factors through COCOMO II, Putnam Estimation Model, Algorithmic models.
Unit: 3	Project Management Techniques: Project Organizations and Responsibilities, Establishing Project Environment, Risk Management Process, Project Tracking and Control Defect Tracking Concepts such as Process monitoring and audit, Reviews, Inspections and Walkthroughs.
Unit: 4	Activity Planning including CPM and PERT**:** Network planning model; Activity-on-arrow network; Precedence network; Forward pass; Backward pass; Critical path; Slack and float.
Unit: 5	Risk Estimation: What is Risk?, Framework for Managing Risks, Risk Identification, Risk Analysis and Prioritization, Risk Avoidance and Mitigation Strategies, Risk Monitoring, Estimating.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Watts S. Humphrey, "Managing the Software Process", Pearson Education
2. Walker Royce, "Software Project Management", Pearson Education

Reference Books:

1. Pankaj Jalote, "Software Project Management in Practice", Pearson Education
2. Bob Hughes, "Software Project Management", TMH

Course Code	Course Title	Lecture			
MMCA404PET	Compiler Design	L	T	P	Semester: IV
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Understand the basic concept of compiler design,
2. To Understand different phases which will be helpful to construct tools .
3. To understand new tools like LEX, YACC, etc.

Course Outcomes:

1. Acquire knowledge in different phases and passes of Compiler, and specifying different types of tokens by lexical analyzer
2. Use the Compiler tools like LEX, YACC, etc.
3. Design different types of compiler tools to meet the requirements of the realistic constraints of compilers.

Detailed Contents:

Unit: 1	Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to Compiler Construction- lexical analysis, Construction of lexical analyze using LEX tool. Phases of Compilation and A simple One-Pass Compiler.
Unit: 2	Context Free grammars and parsing: Context free grammars, derivation, parse trees, ambiguity, Application CFG in compilation-Preprocessing steps in Parsing, LL(1) parsing. Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification.
Unit: 3	Semantics: Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code –abstract syntax tree, translation of simple statements and control flow statements. Context Sensitive features – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations.
Unit: 4	Run time storage: Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation. Code optimization: Principal sources of optimization, optimization of basic blocks, peephole optimization.
Unit: 5	Global optimizations-flow graphs, Data flow analysis of flow graphs. Code generation: Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Blocks.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Compilers Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman., Pearson.
2	

Reference Books:

1	Compiler Design, K. Muneeswaran., Oxford University Press, 2012
2	

Course Code	Course Title	Lecture			Semester: IV
MMCA450PCP	UML LAB	L	T	P	
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. Create a requirements model using UML class notations and use-cases based on statements of user requirements, and to analyse requirements models given to them for correctness and quality.
2. Create the OO design of a system from the requirements model in terms of a high-level architecture description, and low-level models of structural organization and dynamic behaviour using UML class, object, and sequence diagrams.
3. Comprehend enough Java to see how to create software the implements the OO designs modelled using UML.
4. Comprehend the nature of design patterns by understanding a small number of examples from different pattern categories, and to be able to apply these patterns in creating an OO design.
5. Given OO design heuristics, patterns or published guidance, evaluate a design for applicability, reasonableness, and relation to other design criteria.

Course Outcomes:

Detailed Contents:

Draw the use case diagram, class diagram, interaction diagram, activity diagram, state chart diagram, component diagram, and deployment diagram for the following systems:

1. Credit card processing system
2. Online course reservation system
3. Passport automation system
4. E-book management system
5. Railway ticket reservation system
6. Online shopping
7. Online restaurant reservation system
8. Online alumni management system
9. Online gas agency
10. Result management system

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	
2	
Reference Books:	
1	
2	

Course Code	Course Title	Lecture			Semester: IV
MMCA451PCP	Linux Programming LAB	L	T	P	
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

1. To write shell scripts to solve problems.
2. To implement some standard Linux utilities such as Is,cp etc using system calls.

Course Outcomes:

1. Ability to understand the Linux environment.
2. Ability to perform the file management and multiple tasks using shell scripts in Linux environment.

Detailed Contents:

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
3. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
4. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
5. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
6. Write a shell script to list all of the directory files in a directory.
7. Write a shell script to find factorial of a given integer.
8. Write an awk script to count the number of lines in a file that do not Contain vowels.
9. Write an awk script to find the number of characters, words and lines in a file.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:

1	Beginning Linux Programming, 4 Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.
2	Advanced Unix Programming, N.B.VenkateswarUlU, BS Publications.

Reference Books:

1	Unix and Shell Programming, M.G. Venkatesh Murthy, Pearson Education.
2	Unix Shells by Example, 4th Edition, ElIlie Quigley, Pearson Education
3	Sed and Awk, O.Dougherty&A.RObbiflS,2' edition, SPD.

Course Code	Course Title	Lecture			
MMCA501PCT	Cloud Computing and Virtualization	L	T	P	Semester: V
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To introduce the broad perceptive of cloud architecture and model
2. To apply different cloud programming model as per need and set up a private cloud.
3. To understand the design of cloud Services and the trusted cloud Computing system

Course Outcomes:

1. Identify the architecture, infrastructure and delivery models of cloud computing
2. Apply suitable virtualization concept.
3. Design Cloud Services and Set a private cloud

Detailed Contents:

Unit: 1	Cloud Computing Fundamentals:Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , Applications cloud computing, Business models around Cloud – Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim.
Unit: 2	Cluster Computing, Grid Computing, Grid Computing Versus Cloud Computing, Key Characteristics of Cloud Computing. Cloud Models: Benefits of Cloud Models, Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Shared Private Cloud, Dedicated Private Cloud, and Dynamic Private Cloud.
Unit: 3	Cloud Services and File System:Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service- Monitoring as a Service – Communication as services. Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force.
Unit: 4	Virtualization:Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation. Introduction to MapReduce, GFS, HDFS, Hadoop Framework.
Unit: 5	Security in the Cloud:Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.

Reference Books:

1. Cloud Computing "A Practical Approach" Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGraw-Hill.
2. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012

Course Code	Course Title	Lecture			
MMCA502PCT	Web Technology	L	T	P	Semester: V
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Understand the various steps in designing a creative and dynamic website.
2. To Design dynamic and interactive web pages.
3. To bUnderstand the fundamentals of AJAX

Course Outcomes:

1. Develop project management skills related to web development, such as:
2. Develop the ability to communicate effectively to a wide variety of audiences, verbally, in writing, and electronically by:
3. Demonstrate technical skills required of Web Developers through use of W3C standards

Detailed Contents:

Unit: 1	HTML – What is HTML – Basic Structure of HTML Page – Basic Tags – Types of Tags – Lists – Tables – Images – Forms – Frames.
Unit: 2	Dynamic HTML with Java Script: Data validation, Opening a new window, Messages and Confirmations, The status bar, writing to a different frame, Rollover buttons, Moving images, multiple pages in a single download, A text-only menu system, Floating logos.
Unit: 3	Cascading Style Sheet – Introduction – A Simple Specification – Types of Style Sheets – Inline Style Sheets – Internal or embedded style sheets – External Style Sheets – Style Classes – Font Properties – Background properties – Border properties – text properties – margin properties – padding properties – table properties – positioning properties – line/marker properties – outlines – classification.
Unit: 4	Java script – Introduction – Usage of variables – operations – control structures – looping structures – predefined keywords – arrays –predefined functions – user defined functions – arrays and functions – mathematical functions – string functions – objects – expressions – pattern matching using RegEXp Class – String Class – Exception Handling – Built–in objects – Bgcolor/Fgcolor – Date Object – Events and Event Handling – Validations – Window – Confirmation, alert messages.
Unit: 5	XML –Introduction –Document Type Definition or DTD – uses of DTD – Tags – Elements – Attributes – PCDATA – CDATA – Basics of entities – XML Elements PHP:Introduction to PHPEvaluation of Php Basic Syntax Defining variable and constantPhp Data type Operator and Expression Handling Html Form With Php Decisions and loop Decisions Doing Repetitive task with looping Mixing Decisions and looping with Html**Function**Call by value and Call by reference Recursive function String ,Array.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Paul S.WangSanda S. Katila, An Introduction to Web Design Plus Programming, Thomson(2007).
2. Robert W.Sebesta, Programming the World Wide Web, Third Edition, Pearson Education (2007).

Reference Books:

1. Thomas A.Powell, The Complete Reference HTML & XHTML, Fourth Edition, Tata McGraw Hill (2006).
2. Abders Moller and Michael Schwartzbach, An Introduction to XML and Web Technologies, Addison Wesley (2006).

Course Code	Course Title	Lecture			
MMCA503PCT	Cryptography and Network Security	L	T	P	Semester: V
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. Discuss the fundamentals of computer network security concepts and security challenges
2. Understand the classical and modern cryptographic techniques, modular arithmatic, key concepts, Fiestal cipher structure, symmetric and asymmetric key cryptography, factors affecting computer network security deployment.
3. Describe emerging technology in the net-centric security areas and assess their current capabilities, limitations and potential applications.

Course Outcomes:

1. Examine and analyze the difference between stagnography and cryptographic techniques, various public and private key algorithms like RSA, Digital signature, protocols like transport-layer concepts: Transport-Layer services -Reliable vs. un-reliable data transfer -TCP protocol
2. Examine and analyze network security issues like confidentiality, integrity, availability, authentication and authorization, DoS
3. Examine and analyze different network security protocol, Virues, Worms, Trozen Hoarse, Intrusion detection system , Firewall, Private virtual network

Detailed Contents:

Unit: 1	Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stenography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard (DES), strength of DES, differential and linear cryptanalysis of DES, block cipher modes of operations, triple DES.
Unit: 2	Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elgamel encryption.
Unit: 3	Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.
Unit: 4	Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.
Unit: 5	IP Security: Architecture, Authentication header, encapsulating security payloads, Combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic Transaction (SET). System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Cryptography and Network Security by Behrouz A. Forouzan, 2nd Edition TMH.
2	Cryptography and Network Security, W. Stallings, Prentice Hall, 5th Edition, 20102.

Reference Books:

1	Network Security Essentials, William Stallings ,Prentice Hall, 5th Edition, 2013.
2	Firewalls and Internet Security, William R. Cheswick and Steven M. Bellovin, Addison-Wesley Professional, 2ndEdition, 2003.

Course Code	Course Title	Lecture			
MMCA504PCT	Artificial Intelligence	L	T	P	Semester: V
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To Demonstrate working knowledge in Lisp in order to write simple Lisp programs and explore more sophisticated Lisp code on their own
2. To Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information
3. To Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

Course Outcomes:

1. Demonstrate an understanding of various searching algorithms commonly used in artificial intelligence software.
2. Demonstrate an understanding of adversarial search and game-playing agents.
3. Demonstrate an understanding of logic-based agents.

Detailed Contents:

Unit: 1	AI History and Applications: Defining AI: Acting Humanly (Turing Test Approach), Thinking Humanly(Cognitive Modeling Approach), Thinking Rationally (laws of thought approach), Acting Rationally(Rational Agent Approach); Foundations of Artificial Intelligence; History of AI, AI techniques, Expert Systems.
Unit: 2	Problem Solving by Search: Defining the problem as a State Space Search Strategies: Breadth – first Search, Depth- first search, Depth limited search , Iterative Depending depth first search. Heuristic Search Techniques: Hill Climbing, Simulated Annealing, Best First Search: OR Graphs, Heuristic Functions, A* Algorithm, AND –OR graphs, AO* Algorithm.
Unit: 3	Knowledge Representation: Representations and mappings, Approaches to knowledge Representation, Procedural versus Declarative knowledge; Predictive Logic: Representing Simple facts, Instance and Isa relationships in Logic, Proposition versus Predicate Logic, Computable Functions and Predicates- not, Rules of Inferences and Resolution-not, Forward versus Backward Reasoning, Logic Programming and Horn Clauses. Weak slot and Filler Structure: Semantic Nets, Frames. Strong slot Filler Structures: Conceptual Dependency, scripts.
Unit: 4	AI Programming Languages (PROLOG): Introduction, How Prolog works, Backtracking, CUT and FAIL operators, Built –in Goals, Lists, Search in Prolog.
Unit: 5	Connectionist Models / ANN: Foundations for Connectionist Networks, Biological Inspiration; Different Architectures and output functions: Feed forward, Feedback, Recurrent Networks, step, Sigmoid and different functions.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Stuart Russel and Peter Norvig: Artificial Intelligence – A Modern Approach, 2nd Edition Pearson Education.
2. Elaine Rich and Kevin Knight: Artificial Intelligence, Tata McGraw Hill 2nd Ed

Reference Books:

1. N.P.padhy: Artificial Intelligence and Intelligent Systems, Oxford Higher Education, Oxford University Press.
2. George F Luger: Artificial Intelligence- Structures and Strategies for complex Problem Solving, 4th Ed. Pearson Education.
3. Ivan Bratko :PROLOG Programming 2nd Ed., Pearson Education

Course Code	Course Title	Lecture			
MMCA501PET	Software Agents	L	T	P	Semester: V
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To learn the principles and fundamentals of designing agents.
2. To study the architecture design of different agents.
3. To explore the role of agents in assisting the users in day to day activities.

Course Outcomes:

1. Design the architecture for an agent
2. Design the agent in details in a view for the implementation
3. Design typical agents using a tool for different types of applications.

Detailed Contents:	
Unit: 1	Software agents paradiagm Software agent, history, theoretical foundations for software agents, agent programming, agent programming paradigms, agent vs. object, aglet, mobile agents, agent frameworks, agent reasoning, agent applications.
Unit: 2	Agent typology Software agents: collaborative agents, interface agents, mobile agents, information agents, reactive agents, hybrid agents, heterogeneous agent system, smart agents.
Unit: 3	Multiagent systems: Multiagent system, interaction between agents, reactive agents, cognitive agents, interaction protocols, agent coordination, agent negotiation, agent cooperation, agent organization, self- interested agents in ecommerce applications.
Unit: 4	Intelligent software agents: Design and implementation of intelligent agents: reactive, deliberative, planning, interface agents, agent communication languages, agent knowledge representation, agent adaptability, mobile agent applications, languages & tools for design, implementation of intelligent agents.
Unit: 5	Agents and security Agent security issues, mobile agents security, protecting agents against malicious hosts, untrusted agent, black box security, authentication for agents, security issues for aglets.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Constructing Intelligent Agents with JAVA, Bigus&Bigus, Wiley, 1997.
2. Software Agents, Bradshaw, MIT Press, 2000

Reference Books:

1. Artificial Intelligence: A Modern Approach, von Stuart J. Russell, Peter Norvig, Prentice Hall, 1994.
2. Intelligent Software Agents, Rich ard Murch, Tony Johnson, Prentice Hall, 2000

Course Code	Course Title	Lecture			
MMCA502PET	Advanced Computer Network	**L**	**T**	**P**	**Semester:** V
Version:	**Date of Approval:**	3	1	0	

Scheme of Instruction			**Scheme of Examination**		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To build an understanding of the fundamental concepts of computer networking.
2. To introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
3. To allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes:

1. Independently understand basic computer network technology.
2. Understand and building the skills of sub netting and routing mechanisms.
3. Familiar with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Detailed Contents:

Unit: 1	Internetworking, IP Addressing, Subnetting, IP, Address resolution problem, ARP, RARP, Internet control and message Protocols.
Unit: 2	Network layer level protocols, Transport layer protocols, Sockets, Client/server computing, Routing and routing protocols, dynamic host configuration DHCP.
Unit: 3	Multicasting and group management, domain name systems, Issues of Multimedia Networking.
Unit: 4	Application protocols, network address translation, virtual private networks, proxy servers, issues of Network programming, IPv6, Network performance analysis.
Unit: 5	High Performance Networks, any relevant topic decided by teacher, Network management, topics of current research.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill.
2. Walrand&Varaiya,"High Performance Communication Networks", 2/e, Elsevier", 2003

Reference Books:

1. Youlu Zheng / Shakil Akhtar, "Networks for Computer Scientists and Engineers", Oxford University Press.
2. James D. McCabe, "Network Analysis, Architecture & Design, 2/e, Elsevier India", 2004

Course Code	Course Title	Lecture			
MMCA503PET	Quality Assurance and engineering	L	T	P	Semester: V
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To understand software Quality Assurance and engineering.
2. To explain quality assurance and various tools used in quality management.
3. To understand the audit and assessment procedures to achieve quality

Course Outcomes:

1. Knowledge on how to choose which metrics to collect and use them to make predictions.
2. Choose appropriate quality assurance models and develop quality.
3. Ability to conduct formal inspections, record and evaluate results of inspections

Detailed Contents:	
Unit: 1	Quality concepts and productivity relationship, software quality factors, software quality costs, Total Quality Management (TQM), continuous improvement cycle: Plan, Do, Check and Act (PDCA), quality policy, cost of quality, quality engineering, quality planning: goal setting and strategy formation, assessment and improvement.
Unit: 2	Components of SQA, classification, defect detection, defect prevention, defect reduction, defect containment, QA activities in software processes, verification and validation, software review, inspection, formal verification, statistical software quality approach.
Unit: 3	Metrics, product quality metrics, process quality metrics, metrics for software maintenance, quality tools for quality control, test management and organizational structures, Capability Maturity Model (CMM), Capability Maturity Model Integration (CMMI), ISO 9000, quality and quality management metrics, Deming‟s Principle, SQA team formation.
Unit: 4	Integrating quality activities in project life cycle, reviews, software testing, strategies and implementation, Computer-Aided Software Engineering (CASE) tools, The Rayleigh model framework, code integration pattern, Problem Tracking Report (PTR), reliability growth model, Service Quality, Kano Model, Customer retention, continuous process improvement, Juran‟s Trilogy, TQM principles, Kaizen Technique, Statistical Quality Assurance, Mc call quality factors.
Unit: 5	Defect prevention and process improvement, root cause analysis for defect prevention, software inspection, inspection related activities, fault tolerance and failure containment, comparing quality assurance techniques and activities.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1	Metrics and Models in Software Quality Engineering, Stephan H. Kan, Pearson Education, 2007
2	

Reference Books:

1	An Integrated Approach to Software Engineering, PankejJalote, Narosa Publishing House, New Delhi 1997.
2	Making Sense of Software Quality Assurance, Raghav J. Nandyal, Tata McGRAW Hill

Course Code	Course Title	Lecture			
MMCA504PET	Distributed Database	L	T	P	Semester: V
Version:	Date of Approval:	3	1	0	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	60 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	30
Credits	:	4	End Semester	:	70
Instruction Mode	:	Lecture	Exam Duration	:	3 Hrs.

Course Objectives:

1. To explain the techniques used for data fragmentation, replication, and allocation during the distributed database design process.
2. To evaluate simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer.
3. Describe distributed concurrency control based on the distinguished copy techniques and the voting methods

Course Outcomes:

1. Master the concepts and understand the applications of distributed database systems.
2. Construct SQL queries on the distributed database.
3. Understand principles of distributed database transaction management, database recovery, security.

Detailed Contents:

Unit: 1	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.
Unit: 2	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.
Unit: 3	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions.
Unit: 4	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.
Unit: 5	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.

Examination and Evaluation Pattern: It include both internal evaluation (30 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (70 marks) which is mainly end semester examination.

Text Books:

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill.
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill

Reference Books:

1. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education.
2. Ceei and Pelagatti,'Distributed Database', TMH.

Course Code	Course Title	Lecture			Semester: V
MMCA550PCP	Web Technology Lab	L	T	P	
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

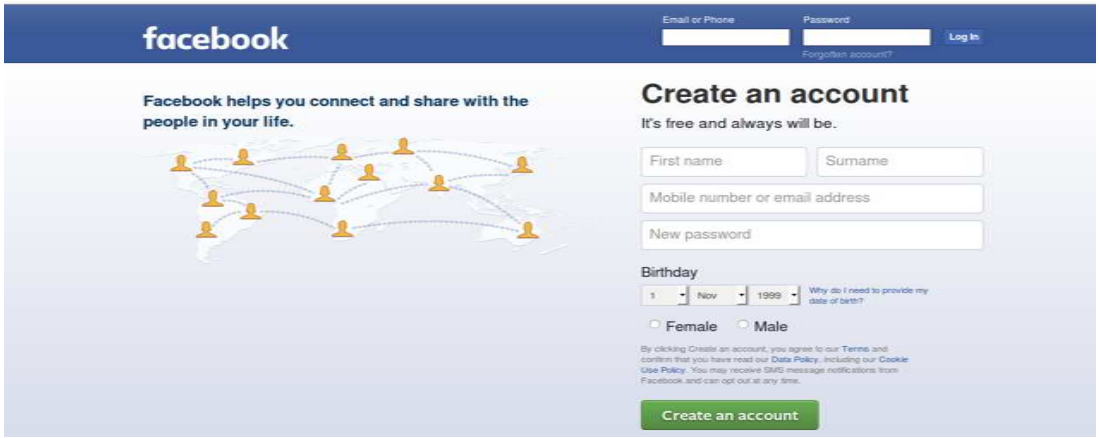
Course Outcomes:

Detailed Contents:

Q1. Design a login page (named login.php) similor to facebook.(Designing show the creativity - use html,css)

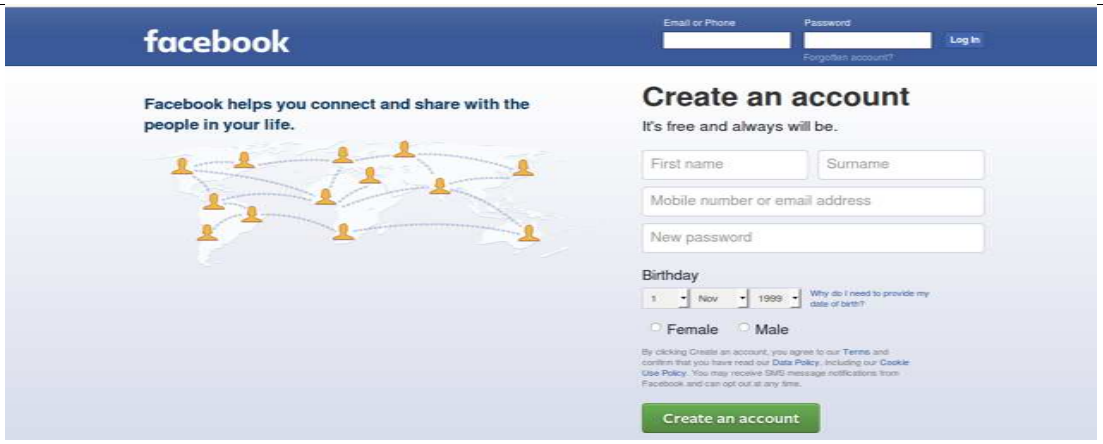
Q2. Design a registration/signup page (named index.php) similor to facebook.(use html & css

(implement already designed login.php page - modules designing are the good practice for the



application designing/development))

Q3. Validate the already designed pages index.php & login.php (use html & css, javascript as required)



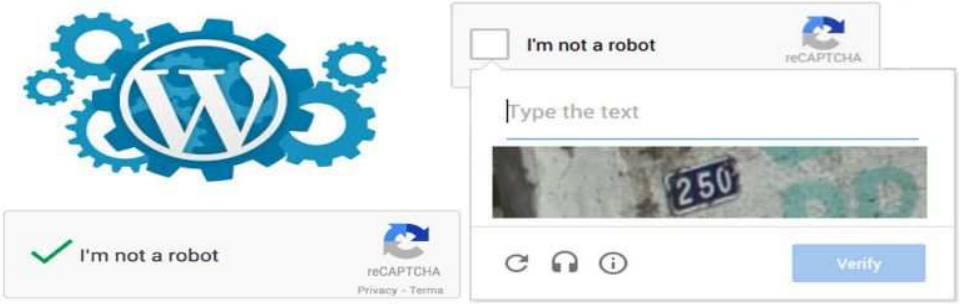
Q4. Server side validation also required on already client side validated page(use php as required) .

Q5. Implementing dynamic application designing pattern received values from some where index.php and/or login.php and send/show it in next page(stolen data/information or *Phishing technique* **)** -use javascript and/or php as required.

Q6. How can we categorise domain name/server from registered emails while creating an accounts example gmail.com etc.

Q7. How to prevent the aoutosubmition can we think to implement the "i am not a robot" technique. This can be implement by text or images based on requirement (recommended text input captcha).

Q8. Design a page similor to



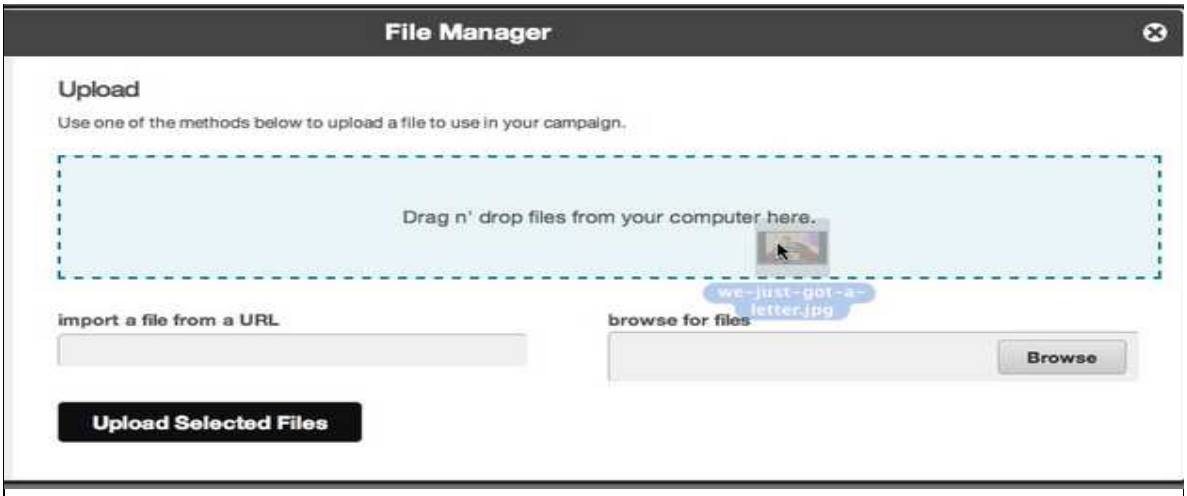
screenshot. uploaded file shoud be save in mydirectory/folder. Renam by duplicate_<dateTime>_<orignalfilename> if already exist , It shoud warning to user.

Note :- it shoud allow to upload -

File type : pdf.

Min size : 5kb .

Max size : 350kb.



Q9. *Design a student profile page it includes fName,lName,father name, dob(datepicker),course (select choice), admission date, phone number upload image.*

While clicking on submit button It shoud create a folder datewise with student name example 02-10-2017_Azhar_Ali. It shoud write all the information in text file and both textfile and student photo shoud save in created folder 10-2017_Azhar_Ali.

Note :- it shoud allow to upload -

File type : jpeg/jpg.

Min size : 5kb .

Max size : 50kb.

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	Paul S.WangSanda S. Katila, An Introduction to Web Design Plus Programming,Thomson(2007).
2	Robert W.Sebesta, Programming the World Wide Web, Third Edition, Pearson Education (2007).
Reference Books:	
1	Steve Swehring,Step by Step Java script ,3rd edition, Published with the authorization of Microsoft Corporation by: O'Reilly Media, Inc.
2	Thomas A.Powell, The Complete Reference HTML & XHTML, Fourth Edition, Tata McGraw Hill (2006).
3	Abders Moller and Michael Schwartzbach, An Introduction to XML and Web Technologies, Addison Wesley (2006).
4	http://nptel.iitm.ac.in/video.php?subjectId=106105084

Course Code	Course Title	Lecture			Semester: V
MMCA551PCP	Artificial Intelligence Lab (PROLOG)	L	T	P	
Version:	Date of Approval:	0	0	4	

Scheme of Instruction			Scheme of Examination		
No. of Periods	:	30 Hrs.	Maximum Score	:	100
Periods/ Week	:	4	Internal Evaluation	:	50
Credits	:	2	End Semester	:	50
Instruction Mode	:	Practical	Exam Duration	:	3 Hrs.

Course Objectives:

Course Outcomes:

Detailed Contents:

1. Write a program to demonstrate Inference Concept in Prolog?
2. Write a program to implement and check Car Database system?
3. Write a program on External Goal?
4. Write a program on internal Goal?
5. Write a program for testing the Graph?
6. Write a program on FAIL predicate to find all Solutions?
7. Write a program on List processing with fail predicate?
8. Write a program on Recursion to print a set of numbers?
9. Write a program to process List with Header?
10. Write a program on Exclusion using FAIL predicate?
11. Write a program to implement Login mechanism without recursion?
12. Write a program to implement Login mechanism with Repeat Predicate?
13. Write a program to implement Login mechanism without repeat predicate with recursion?
14. Write a program to test whether an element is a member of list or not?
15. Write a program on CUT predicate to prevent backtracking?
16. Write a program addition of two integers using built-in predicates?
17. Write a program to find square root of a number?
18. Write program comparison operators?
19. Write a program to implement simple Counter?
20. Write a program to generate Random Numbers?

Examination and Evaluation Pattern: It include both internal evaluation (50 marks) comprising two class sessional exams/ assignments/ quiz/ seminar presentation etc. and external evaluation (50 marks) which is mainly end semester examination.

Text Books:	
1	
2	
Reference Books:	
1	
2	