Syllabus for M.C.A. (Under Science Faculty) in affiliated colleges to Savitribai Phule Pune University

Credit Based System

☐ **Course Structure –**

DURATION: The entire Programme is a Three year and Six semester full time Programme.
NO. OF COURSES: For first five semesters there will be Six courses. The last semester will be Industrial training/Institutional project and two theory courses.

☐ **Salient Features –**

1. Each Theory course will be of 4 credits and each Lab. Course (Practical) of 5 credits.
2. Each semester is of 6 courses and 25 credits (This is not applicable for Industrial training in VI semester of M.C.A.).
3. Each regular student will have to appear for all the 25 credits of the respective semester.
4. Student who wishes to take admission to the second year M.C.A should have obtained at least 25 credits out of 50 credits of the First year M.C.A.
5. A student will have to complete at least 75% credits (other than for IT – SemVI) from M.C.A. (Under Science Faculty) syllabus. The remaining 25% credits (other than for IT–SemVI) can be chosen from the courses offered by the other Departments/subjects (other than Computer Science courses) with credits system structure.

☐ **Evaluation Rules –**

Pattern of Examination

Evaluation of Students:

1) The In-semester and End-Semester examinations will be of 50 marks each.
2) Student has to obtain 40% marks in the combined examination of In-Semester and End-Semester assessment with minimum passing of 30% passing in both assessments separately.
3) A student cannot register for third semester/fourth semester if s/he fails to complete the minimum of 50% credits of the total credits of two semesters of the first year.
4) Internal marks will not change. Student cannot repeat internal assessment. If student misses internal assessment examination, s/he will have second chance with the permission of the concerned teacher. But it will not be right of the student. It will be the discretion of the concerned teacher and internal departmental assessment committee.
5) There shall be revaluation of answer script of end semester examination, but not of internal assessment papers.

6)   Internal assessment (IA) answer scripts may be shown to the concerned student but not end semester answer script.

Internal Assessment (Continuous Assessment): Internal assessment for each course would be continuous and dates for each tutorials/practical tests will be pre-notified in the time table for teaching or placed separately as a part of time table. Department / College Internal Assessment Committee will coordinate this activity

Theory Courses: Conducting written tests should not be encouraged. More focus should be on non-written tests. Students should be encouraged to conduct various academic activities. A teacher must select a variety of the procedures for internal assessment suggested as follows.

a) Mid-term test
b) On-line test
c) Open book test (concerned teacher will decide the allowed books)
d) Tutorial
e) Surprise test
f) Oral
g) Theory Assignments
h) Review of Research paper
i) Seminar presentation
j) Journal/Lecture/Library notes
k) Group Discussion
l) Programming Assignments

Student has to preserve the documentation of the internal assessment except midterm test answer script. It is the responsibility of the student to preserve the documents.

Project Courses : The Project can be platform, Language and technology independent. Project will be evaluated by project guide. Assessment will be done weekly in the respective batch. Evaluation will be on the basis of weekly progress of project work, progress report, oral, results and documentation.

University Examination (**UE**): End-Semester examination for 50 marks per course would be held as per the scheduled given by University of Pune.

1. If a student fails in a course of any semester then the student can appear only for the End of Semester Examination of the following semester. However he/she can improve the Internal Assessment (continuous assessment) performance in any of the forthcoming semesters in which the course is subsequently conducted and in this case, the student will have to appear for End of Semester Examination also for the said course.

2. The assessment of 17 credits towards VIth semester (Full Time Industrial Training / Institutional project) will be carried out as follows:

   i. A student will inform the department about the joining date of the above mentioned training.

   ii.   The student will have to make minimum two presentations, one in the third month and the other at the end of the training programme. These presentations will be considered towards CA.

   iii.   The student will have to submit a Dissertation/Report to the department which will be assessed towards course credits.

Award of Class

Grades will be awarded from grade point average (GPA) of the credits.

GPA Rules:

1. The formula for GPA will be based on Weighted Average. The final GPA will not be printed unless a student passes courses equivalent to minimum 150 credit hours (Science). Total credits hours means the sum of credit hours of the courses which a student has passed.
2. A seven point grade system [guided by the Government of Maharashtra Resolution No. NGO – 1298 / [4619] / UNI 4 dt. December 11, 1999 and University regulations] will be followed. The corresponding grade table is attached herewith.
3. If the GPA is higher than the indicated upper limit in the third decimal digit then the student be awarded higher final grade (e.g. a student getting GPA of 4.492 may be awarded 'A')
4. For Semester I, II, III examinations, only the grade points will be awarded for each subject. Final GPA along with final grade will be awarded only at the end of IV semester. There is also a provision for verification and revaluation. In case of verification, the existing rules will be applicable. The revaluation result will be adopted if there is a change of at least 10% marks and in the grade of the course.
5. After the declaration of result, for the improvement of Grade, the student can reappear for the examination of minimum 30 credits worth theory courses.

Grade and Grade Point Average				Final Grade Points	
Marks	Obtained Grade	Grade Points		Grade Points	Final Grade
100 – 75	'O' Outstanding	06		5.00 – 6.00	O
74 – 65	'A' Very Good	05		4.50 – 4.99	A
64 – 55	'B' Good	04		3.50 – 4.49	B
54 – 50	'C' Average	03		2.50 – 3.49	C
49 – 45	'D' Satisfactory	02		1.50 – 2.49	D
44 – 40	'E' Pass	01		0.50 – 1.49	E
39 and less	'F' Fail	00		0.00 – 0.49	F

Common Formula for Grade Point Average (GPA):

$$GPA = \frac{Total\ of\ Grade\ Points\ earned\ \times\ Credit\ hours\ for\ each\ course}{Total\ Credit\ hours}$$

B Grade is equivalent to at least 55% of the marks

External Students: There shall be no external students.

Setting of Question Paper / Pattern of Question Paper

For core (compulsory) theory courses end semester question papers set by the University of Pune and centralized assessment for theory papers done as per the University guidlines.

Verification / Revaluation

☐ There is also a provision for verification and revaluation. In case of verification, the existing rules will be applicable. There shall be revaluation of end semester examination, but not of internal assessment.

Completion of Degree Programme

1) As soon as a student obtains 150 credits (completion of Industrial training (IT) and 75% of the credits from the syllabus excluding IT is essential), the student will be deemed to have completed the requirements of the M.C.A.(Science) degree programme.
2) If a student has failed in a course then the said course will not be taken into account for calculating GPA and overall grade. In fact, all the courses in which a student has passed will be taken into account for calculating the GPA and overall grade.
3) The policies and procedures determined by University will be followed for the conduct of examinations and declaration of the result of a candidate

Course Structure MCA (Science) for Affiliated Colleges

Year/ Semester	Subject	Paper	Title of Paper	Hours / Week	Credit	% of Assessment		
						IA	UE	Total
I Year Sem-I	Core	CA-101	Programming with C	4	4	50	50	100
	Core	CA-102	DBMS	4	4	50	50	100
	Core	CA-103	Mathematical Foundation	4	4	50	50	100
	Core	CA-104	Concrete Mathematics Graph Theory	4	4	50	50	100
	Core	CA-105	Computer Organisation	4	4	50	50	100
	Core	CA-106	Lab on CA-101 & CA-102	4	5	50	50	100

Minimum Credit : 25, Core Subject is compulsory IA- Internal Assessment, UE – University Examination.

Year/ Semester	Subject	Paper	Title of Paper	Hours/ Week	Credit	% of Assessment		
						IA	UE	Total
I Year Sem-II	Core	CA-201	Data Structures	4	4	50	50	100
	Core	CA-202	TCS	4	4	50	50	100
	Core	CA-203	OOP- C++	4	4	50	50	100
	Core	CA-204	Computer Networks	4	4	50	50	100
	Core	CA-205	ADBMS	4	4	50	50	100
	Core	CA-206	Lab. on CA-201,CA-203 & CA-205	4	5	50	50	100

Minimum Credit : 25 , Core Subject is compulsory. IA- Internal Assessment, UE – University Examination.

Year/ Semester	Subject	Paper	Title of Paper	Hours / Week	Credit	% of Assessment		
						IA	UE	Total
II Year Sem-III	Core	CA-301	DAA	4	4	50	50	100
	Core	CA-302	Operating System	4	4	50	50	100
	Core	CA-303	Software Engineering	4	4	50	50	100
	Core	CA-304	Java	4	4	50	50	100
	Core	CA-305	Lab. on 302 & 304	4	5	50	50	100
	Elective	CA-306	Project	4	4	50	50	100
	Elective	CA-307	Numerical Methods	4	4	50	50	100
	Elective	CA-308	Multimedia Systems	4	4	50	50	100
	Elective	CA-309	Dot Net	4	4	50	50	100

Minimum Credit : 25 , Maximum Credit 29 . Core Subject is compulsory, From elective courses student can select one course for Minimum credit and Two for Maximum Credit. IA- Internal Assessment, UE –University Examination.

Year/ Semester	Subject	Paper	Title of Paper	Hours / Week	Credit	% of Assessment		
						IA	UE	Total
II Year Sem-IV	Core	CA-401	Computer Graphics	4	4	50	50	100
	Core	CA-402	SDK	4	4	50	50	100
	Core	CA-403	Advance Java	4	4	50	50	100
	Core	CA-404	Object oriented Software Engineering	4	4	50	50	100
	Core	CA-405	Lab. on 401,402 &403	4	5	50	50	100
	Elective	CA-406	Project	4	4	50	50	100
	Elective	CA-407	Cyber Law	4	4	50	50	100
	Elective	CA-408	Soft Computing	4	4	50	50	100
	Elective	CA-409	Artificial Intelligence	4	4	50	50	100

Minimum Credit : 25 , Maximum Credit 33 . Core Subject is compulsory, From elective courses student can select one course for Minimum credit and Three for Maximum Credit. IA- Internal Assessment, UE –University Examination.

Year/ Semester	Subject	Paper	Title of Paper	Hours / Week	Credit	% of Assessment		
						IA	UE	Total
II IYear Sem-V	Core	CA-501	Internet Programming	4	4	50	50	100
	Core	CA-502	Principle of Programming Langauges	4	4	50	50	100
	Core	CA-503	Data Mining & Warehousing	4	4	50	50	100
	Core	CA-504	Software Project Management	4	4	50	50	100
	Core	CA-505	Lab. on 501,502 &505	4	5	50	50	100
	Elective	CA-506	Project	4	4	50	50	100
	Elective	CA-507	Image Processing	4	4	50	50	100
	Elective	CA-508	E-Commerce	4	4	50	50	100
	Elective	CA-509	Mobile Computing	4	4	50	50	100

Minimum Credit : 25 , Maximum Credit 33 . Core Subject is compulsory, From elective courses student can select one course for Minimum credit and Three for Maximum Credit. IA- Internal Assessment, UE –University Examination.

Year/ Semester	Subject	Paper	Title of Paper	Hours / Week	Credit	% of Assessment		
						IA	UE	Total
III Year Sem-VI	Core	CA-601	Industrial Training /Institutional project	--	17	25	75	100
	Elective	CA-602	Software Testing & Quality Assurance	4	4	50	50	100
		CA-603	Embedded Systems	4	4	50	50	100
		CA-604	Information Security And Audit	4	4	50	50	100
		CA-605	Cloud Computing	4	4	50	50	100

Core Subject is compulsory. If student had completed 133 credit within Five semesters then no need to select any elective course. Otherwise student should select required elective courses to complete 150 credit.

M.C.A.(Science) Year-III Sem V

CA- 501: Internet Programming

Prerequisites:

- Basics of Operating Systems, Scripting Languages, Networking

Objectives:

- What is PHP? , Server side scripting vs. Client side scripting
- Understand how the client-server model of Internet programming works.
- Understand how Internet programming tasks are accomplished.
- Get the knowledge of Server side Programming Tools

Syllabus:

UNIT - 1: Introduction to Internet Programming
Client <-> Server model, Browsers - Graphical and Hypertext Access to the Internet, HTTP - HyperText Transfer Protocol (how it actually works)

UNIT - 2: Overview of Language Essentials
Data Types, Variables, Embedding PHP into web pages, Arrays, Objects, Strings and functions

UNIT - 3: HTML forms processing
Building a form, Text fields and value, size, maxlength, html buttons, radio, checkboxes, prechecked, Selection lists, Introduction to CGI scripting, Action and Method - GET and POST, Reading files, Reading from other Servers
Security: Filtering Input and Escaping Output

UNIT - 4: Cookies and Sessions
HTTP basics, processing forms, server Information, setting response header, maintaining state

UNIT - 5: Databases
       Accessing Databases, PEAR DB Basics

UNIT - 6: XML
Basics of XML, parsing XML, Web services, JSON repsonses

UNIT - 7: Security

Global variables, filenames, file uploads, file permissions, Filtering Input and Escaping Output

UNIT - 8: Graphics
Embedding an image into page, GD extensions, basic concepts, creating and drawing images, images with text, scaling images, color handling

UNIT - 9: Email via Scripts

TEXT BOOKS

- Advance Internat Technologies , Shah Wiley Publication
- Web Technology Black book , Kogent , Wiley Publication
- PHP Programming by orielly series.
- Beginning XML by David Hunter and David Gibbons.

REFERENCES

- PHP Jquery Cookbook by Vijay Joshi, PACKT Publishing
- Core PHP Programming by Leon Atkinson

CA-502: Principles of Programming Languages

Course Prerequisites:
Experience with a procedural language like C
Experience with an OOP language C++, and Java
Basic knowledge of algorithms and data structure concepts.

Objectives:
To understand how language features work.
To develop a greater understanding of the issues involved in programming language design and implementation
To understand design/implementation issues involved with data, data types, control flow, subroutines, parameter passing
To understand concepts of object orientation, data abstraction, and implementation
To introduce several different paradigms of programming using programming languages.

Chapter 1: Introduction
Programming Languages and Paradigms, Programming language spectrum, Programming Environments

Chapter 2 : Functional Programming Language
Basic LISP Primitives, Procedure definition and binding, Predicates and Conditional, Procedure Abstraction and Recursion

Chapter 3 : Programming language based on Logic (Turbo Prolog)
Introduction, Facts, Objects and Predicates, Variables, Using Rules, Input and Output, Controlling execution – fail, repeat and cut predicate, Arithmetic operations, Compound objects, Dynamic database, Lists, Strings, Files

Chapter 4 :Names, Scopes, and Bindings
The Notion of Binding Time, Object Lifetime and Storage Management, Scope Rules, The meaning of Names in a Scope, The Binding of Referencing Environments, The Binding of Referencing Environments, Macro Expansion

Chapter 5 : Data Types

Introduction, Primitive Data Types, Character String Types, User defined Ordinal types- Enumeration & Subrange types, Array types, Associative Arrays, Record types, Union Types, Pointer and Reference Types

Chapter 6 : Control Flow

Expression Evaluation, Structured and Unstructured Flow, Sequencing, Selection, Iteration, Recursion

Chapter 7: Subprograms and Implementing subprograms

Fundamentals of subprograms, Design issues for subprograms, Local referencing environments, Parameter passing methods, Parameters that are subprograms, Overloaded subprograms, Generic subprograms, Design issues for functions, User-Defined overloaded operators, Co-routines, Semantics of Calls and Returns, Implementing "Simple" Subprograms , Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks, Implementing Dynamic Scoping

Chapter 8: Data Abstraction and Object Orientation

Object-Oriented Programming, Encapsulation and Inheritance, Initialization and Finalization, Dynamic Method Binding, Multiple Inheritance

Books:

B1. Scott Programming Language Pragmatics, 3 rd edition, ISBN 9788131222560 Kaufmann Publishers, An Imprint of Elsevier, USA

B2. Concepts of Programming Languages, 8 th Edition by Robert W. Sebesta, Pearson Education.

B3. LISP 3rd edition by Patrick Henry Winston & Berthold Klaus Paul Horn (BPB)

B4. Introduction to Turbo Prolog by Carl Townsend

B5. Programming Language Concepts third edition, Ghezzi , wiley publication

Evaluation Scheme:

The duration of the ESE paper will be 3 Hours and 50 marks. There will be 8 questions each of 10 marks and student can solve any 5 out of 8 questions. Final question paper will be of 80 marks (with options) and chapter wise distribution will be as follows:

Sr. No.	Chapter	No of Lect.	Weightage Marks
1	Introduction	02	04
2	Functional Programming Language	05	6
3	Programming language based on Logic (Turbo Prolog)	10	14
4	Names, Scopes, and Bindings	05	10
5	Data Types	08	14
6	Control Flow	05	10
7	Subprograms and Implementing subprograms	07	14
8	Data Abstraction and Object Orientation	06	08
	Total	48	80

- 6 Questions are supposed to be of the format 4 + 4 + 2 (4 +3 +3 or 5 +3 +2)
- 2 Questions are supposed to be of the format 5 +5
- The layout should be such that

- There should not be more than one sub questions on the same unit

- There should not be more than one question containing sub questions on the same pair of units.

CA-503: Data Mining & Warehousing

Pre – Requisites

1. Knowledge of Data base Fundamentals
2. Basic understanding of analysis of algorithms
3. Basic Statistical concepts related to measures of central tendency and dispersion

Objectives

1. To study the structure of Data Warehouse and the ETL process
2. To study different data pre processing techniques.
3. To study basic descriptive and predictive data mining techniques
4. To study some advanced data mining techniques and their applications
5. To use data mining tool on different data sets

Chapter I: Introduction to Data Mining

Definition of Data Mining and Data Warehousing, DM versus Knowledge Discovery in Databases, Data to be mined, basic mining techniques, Data Mining Issues, Data Mining Metrics, Social Implications of Data Mining, Overview of Applications of Data Mining

Chapter II: Data Preprocessing

Data Processing prerequisites, Attributes and Data types, Statistical descriptions of data, Distance and similarity measures, Need for Preprocessing, Handling Missing data , Data Cleaning, Data Integration , Data Reduction, Data Transformation and Data Discretization

Chapter III: Introduction to Data Warehousing

Architecture of DW, OLAP and Data Cubes, Dimensional Data Modeling-star, snowflake schemas, DMQL.

Chapter IV: Association Rule Mining

Market Basket analysis, Frequent item-sets and Association rule mining: Apriori algorithm, FP growth algorithm, sampling Algorithms.

Chapter V: Classification & Prediction

Definition of classification, Model construction, Model Usage, choosing algorithm, Decision tree Induction, Information gain, gain ratio, gini index, Bayesian Classification, Bayes Theorem, Naïve Bayes classifier, Measuring performance of classifiers, Precision, recall, F-measure, confusion matrix, cross-validation, bootstrap, Linear Regression, Non-linear Regression, Logistic Regression

Chapter VI: Clustering
Definitions, Partitioning methods, Hierarchical clustering, Density Based methods

Chapter VII: Data Mining Tool
Weka, Performance measures TP, FP, ROC, baseline algorithms zeroR, oneR

Text Books:

1. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, Elsevier Morgan kaumann publishers, ISBN:9789380931913

2. Margaret H. Dunham, S. Sridhar, Data Mining – Introductory and Advanced Topics, Pearson Education

3. Modern Data warehousing and mining and visualization George Marak Pearson publication

Reference Books:

1. Tom Mitchell, ─Machine Learning, McGraw-Hill, 1997

2. R.O. Duda, P.E. Hart, D.G. Stork. Pattern Classification. Second edition. John Wiley and Sons, 2000.

3. Christopher M. Bishop, ─ Pattern Recognition and Machine Learning, Springer 2006

4. Ian H.Witten, Eibe Frank Data Mining: Practical Machine Learning Tools and Techniques, Elsevier/(Morgan Kauffman), ISBN:9789380501864

5. Data warehousing: fundamentals fot IT professionals 3rd edition , Kimball, Wiley Publication

CA-504: Software Project Management

Prerequisites:

- Knowledge of Software Engineering
- Basics of Software Testing

Objectives:

- Project Management covers skills that are required to ensure successful medium and large scale software projects.
- It examines Requirements Elicitation, Project Management, Verification and Validation and Management of Large Software Engineering Projects.
- Student learn to select and apply project management techniques for process modeling, planning, estimation, process metrics and risk management; perform software verification and validation using inspections, design and execution of system test cases.

Syllabus:

UNIT 1: Introduction to Project Management
What is Project?, What is Project Management? Role of Project Manager, Ethics in Project Management.

UNIT 2: Project Management and Information Technology Context
A Systems View of Project Management, The Three-Sphere Model for Systems Management, Stakeholder Management, Project Phases and the Project Life Cycle, The Context of Information Technology Projects

UNIT 3: Project Integration Management
What is Project Integration Management? , Strategic Planning and Project Selection, Developing a Project Charter, Developing a Project Management Plan

UNIT 4: Project Scope Management
What Is Project Scope Management?, Collecting Requirements, Defining Scope, Creating the Work Breakdown Structure, Verifying Scope, Controlling Scope

UNIT 5: Project Time management
The importance of Project Schedule, defining activities, sequencing activities, Estimating Activity Resources, Estimating Activity Durations, Developing the Schedule, Numerical on CPM

UNIT 6: Project Cost Management
The importance of Cost Management, Basic Principles of Cost Management, Estimating Costs, Controlling Costs, Earned Value Management, Numerical on COCOM

UNIT 7: Quality Management
The Importance of Project Quality Management, What Is Project Quality Management? , Planning Quality, Performing Quality Assurance, Performing Quality Control, Modern Quality Management, Deming and his 14 Points for Management

UNIT 8: Human Resource Management
What Is Project Human Resource Management?, The Importance of Human Resource Management, Project Organizational Charts, staff acquisition

UNIT 9: Communication Management
Reporting Performance, Suggestions for Improving Project Communications

UNIT 10: Risk Management
The Importance of Project Risk Management, Planning Risk Management, Common Sources of Risk on Information Technology Projects. Identifying Risks, Performing Qualitative Risk Analysis , Using Probability/Impact Matrixes to Calculate Risk Factors

UNIT 11: Procurement Management
The Importance of Project Procurement Management, Planning Procurements , Tools and Techniques for Planning Procurements, Procurement Management Plan , Statement of Work , Procurement Documents, Source Selection Criteria

Reference Books
1. Information Technology Project Management, 6th Edition Kathy Schwalbe ISBN-13 :9781111221751 , Cenage Learning
2. Software Engineering: A Practioner's Approach by Roger S. Pressman ISBN: 9780071267823
3. Software Project Management Black Book Kogent, Wiley publication
4. Software Project Management : A real world Joel Henry Pearson publication

CA-507: Image Processing

1. Introduction

Definition of Digital Image Processing, Origins of Digital Image Processing, Examples of fields that use Digital Image Processing - X-ray Imaging, Ultraviolet Band, Visible and Infrared Bands, Microwave Band, and Radio Band Imaging; Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

2. Digital Image Fundamentals

Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition - Single Sensor, Sensor Strips, Sensor Arrays, A Simple Image Formation Model; Image Sampling and Quantization - Spatial and Gray-Level Resolution, Aliasing, Some Basic Relationships between Pixels -
Neighbors, Adjacency, Connectivity, Regions, and Boundaries, Distance Measures, Image Operations on a Pixel Basis; Linear and Nonlinear Operations

3. Image Enhancement in the Spatial Domain

Some Basic Gray Level Transformations - Negatives, Log, Power-Law, Piecewise-Linear Transformations; Histogram Processing - Histogram Equalization; Enhancement Using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering, Smoothing Spatial Filters – Smoothing Linear and Order-Statistics Filters; Sharpening Spatial Filters - Use of First Derivatives for Enhancement, Use of Second Derivatives for Enhancement : The Laplacian, High Boost Filtering, High Frequency Emphasis Filtering

4. Image Enhancement in the Frequency Domain

Introduction to the Fourier Transform and the Frequency Domain, Two-Dimensional DFT and its Inverse, Some Properties of the 2-D Fourier Transform; Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domains, The Convolution Theorem(Only 2D);
Frequency-Domain Lowpass Filters - Ideal , Butterworth, and Gaussian
Frequency Domain Highpass Filters - Ideal , Butterworth, and Gaussian
Unsharp Masking, High-Boost Filtering, and High-Frequency Emphasis Filtering

5. Image Restoration

A Model of the Image Degradation/Restoration Process, Noise Models; Restoration in the Presence of Noise Only – Spatial Filtering - Mean, Order-Statistics, and Adaptive Filters;

Periodic Noise Reduction by Frequency Domain Filtering – Band reject, Band pass, and Notch Filters;
Estimating the Degradation Function - Estimation by Image Observation, Experimentation and Modeling; Inverse Filtering, Geometric Mean
Filter - Geometric Transformations, Spatial Transformations

6. Morphological Image Processing

Some Basic Concepts from Set Theory, Logic Operations Involving Binary Images; Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation; Some Basic Morphological Algorithms - Boundary Extraction, Region Filling, Extraction of Connected Components, Thinning, Thickening

7. Image Segmentation

Detection of Discontinuities - Point Detection, Line Detection, Edge Detection, Edge Linking and Boundary Detection, Thresholding- The Role of Illumination, Basic Global Thresholding, Basic Adaptive Thresholding, Region-Based Segmentation -Region Growing, Region Splitting and Merging

Representation and Description

Chain Codes, Polygonal Approximations, Signatures, Shape Methods (Mathematical Problems)

Text Book:
1. Gonzalez, R. C. and Woods, R. E. [2002/2008], Digital Image Processing, 2nd/3rd edition, Prentice Hall

Reference Books:

1. Sonka, M., Hlavac, V., Boyle, R. [1999]. Image Processing, Analysis and Machine Vision (2nd edition), PWS Publishing, or (3rd edition) Thompson Engineering, 2007

2. Gonzalez, R. C., Woods, R. E., and Eddins, S. L. [2009]. Digital Image Processing Using MATLAB, 2nd ed., Gatesmark Publishing, Knoxville, TN.

3. Anil K. Jain [2001], Fundamentals of digital image processing (2nd Edition), Prentice-Hall, NJ

4. Willian K. Pratt [2001], Digital Image Processing (3rd Edition), John Wiley & Sons, NY

5. Burger, Willhelm and Burge, Mark J. [2008]. Digital Image Processing: An Algorithmic Introduction Using Java, Springer

6. Digital Image Analysis (With CD-ROM), Kropatsch, Springer, ISBN 978038795066

7. Digital Image Processing, 6e (With CD), Jähne, Springer, ISBN:978-3-540-24035-8 2

8. Fundamentals of digital image processing S.Annadurai Pearson education

CS-508: E-Commerce

Objectives -:
    1. To know the concept of electronic commerce
    2. To Know what is Internet and Extranet
    3. To know Internet marketing techniques

Unit No	Topic
1	**INTRODUCTION TO E-COMMERCE** 1.1 Meaning and concept of E-Commerce; 1.2 History of E-Commerce; 1.3 Traditional Commerce and E-Commerce; 1.4 Different types of E-Commerce – B2B, B2C, C2C, B2E, G2C; 1.5 Need and Role of E-Commerce; 1.6 Advantage and Disadvantage of E Commerce
2	**E-COMMERCE TECHNOLOGIES** 2.1 Internet & WWW; 2.2 Internet Protocols – OSI Model, TCP/IP, TCP, UDP, IP, DNS, FTP; 2.3 Multimedia technology – ISDN, ATM, Cell relay, desktop,Video Conferencing; 2.4 Information Publishing Technology - HTML, URL, HTTP, HTML FORM, HTTPD, CGI SERVICES, Web Server and client; 2.5 **Advance Technologies –** Mobile Agents, WAP, XML, web 2.0, REST web services,Web Mashup.
3	**E-COMMERCE STRATEGIES** 3.1 Consumer Oriented – strategies for marketing, sales & promotion, e-CRM, order delivery Cycle; 3.2 Business Oriented - strategies for purchasing & support activities (SCM), Strategies for Web Auction, 3.3 Virtual Communities 3.4 Web Portal.
4	**ELECTRONIC PAYMENT SYSTEM** 4.1 Introduction to payment system; 4.2 Online Payment System – prepaid e-payment service, postpaid e-payment system; 4.3 SET protocol; 4.4 Operational, Credit & legal risk of e payment system.
5	**ELECTRONIC DATA INTERCHANGE** 5.1 Meaning EDI and Paperless trading; 5.2 EDI architecture; 5.3 EDI standards; 5.4 VAN; 5.5 Cost of EDI Infrastructure; 5.6 Internet based EDI; 5.7 FTP- based messaging.
6	**E-COMMERCE INFRASTRUCTURE** 6.1 Cluster of servers; 6.2 Virtualization techniques; 6.3 Cloud Computing; 6.4 Server Consolidation using cloud; 6.5 Introduction to Hadoop, HDFS, Google Apps Engine.

7	**SECURITY & LEGAL ISSUES**
	7.1 Computer security classification;
	7.2 E-Commerce threats;
	7.3 Security of Clients and sever;
	7.4 Cyber law introduction;
	7.5 Copyright and intellectual Property concept relating to ecommerce.

References :

1. Bharat Bhasker, Electronic Commerce – Frame work technologies and Applications, 3rd Edition. Tata McGrawHill Publications, 2008.
2. Kamlesh K.Bajaj and Debjani Nag, Ecommerce- the cutting edge of Business, Tata McGrawHill Publications, 2008
3. Kalakota et al, Frontiers of Electronic Commerce, Addison Wesley, 2004
4. E- Commerce Strategies, Technology and applications (David) Tata McGrawHill
5. Introduction to E-commerce (jeffrey) Tata- Mcgrawhill
6. E-Business and Commerce- Strategic Thinking and Practice (Brahm) biztantra
7. Google Aps engine (Severance) O'reilly
8. Hadoop : The Definitive Guide (White) O'reilly

CA-509: Mobile Computing

Prerequisite
Knowledge of TCP/IP protocol suite and Java Programming is essential.

Objectives
- To create awareness about mobile computing technology
- To create awareness about new programming platforms for mobile and wireless technologies
- To make our students capable for the current and emerging new trends in IT from software development point of view.

1. **Introduction to Mobile Computing**
    1.1. Reference Model **(Book 1, Chapter 1)**
    1.2. Spread Spectrum **(Book 1, Chapter 2)**
    1.3. Cellular Systems **(Book 1, Chapter 2)**
    1.4. Mobile Computing **(Book 2, Chapter 1**)
        1.4.1. Mobile Computing Functions
        1.4.2. Mobile Computing Devices
        1.4.3. Dialogue Control
        1.4.4. Networks - Wireline Networks, Wireless Networks, Ad hoc Networks
        1.4.5. Bearers
    1.5. Middleware and Gateways **(Book 2, Chapter 1**)
    1.6. Application and Services **(Book 2, Chapter 1**)
    1.7. Developing Mobile Computing Applications **(Book 2, Chapter 1**)

2. **Mobile Computing Architecture (Book2, Chapter2)**
    2.1. Three-tier Architecture-Presentation, Message-oriented Middleware(MOM), Transaction-Processing (TP) Middleware, Data,
    2.2. Design Considerations for Mobile Computing
    2.3. Client Context Manager
    2.4. Context Aware Systems

3. **Emerging Technologies (Book 2, Chapter 4)**
    3.1. Bluetooth – protocol stack, security, Application Model
    3.2. Radio Frequency Identification (RFID) and its Applications
    3.3. Wireless Broadband (WiMAX)

4. **Telecommunication Systems (Book 2, Chapter 5, 6, 7)**
    4.1. GSM – Mobile Services, System Architecture, localization and calling, Handover, Security
    4.2. Short Messaging Service (SMS) – Strength of SMS, SMS Architecture, Short Message Mobile Terminated (SM MT), Sort Message Mobile Originated (SM MO), SMS as Information Bearer, Operator Centric – Pull, Operator-independent Push, Challenge for

SMS as a Mobile Computing Bearer, Operator – independent Pull, Value Added Services through SMS, Alert Services, Location-based software,

4.3. GPRS – Architecture, Data Services in GPRS, Applications for GPRS, Limitations of GPRS, Billing and Charging in GPRS

5. Mobile Network Layer (Book 1, Chapter 8)
5.1. Mobile IP
    5.1.1. Goals, Assumptions and Requirements
    5.1.2. Entities and Terminologies
    5.1.3. IP Packet Delivery
    5.1.4. Agent Discovery
    5.1.5. Registration
    5.1.6. Tunnelling and encapsulation
    5.1.7. Optimizations
    5.1.8. Reverse Tunneling
    5.1.9. IPV6 for mobile IP
    5.1.10. IP-Micromobility support
5.2. Mobile Ad-hoc Networking
    5.2.1. Routing
    5.2.2. Destination Sequence Distance Vector (DSDV)
    5.2.3. Dynamic Source Routing (DSR)
    5.2.4. Alternative Metrics
    5.2.5. Flat ad-hoc routing
    5.2.6. Hierarchical ad-hoc routing
    5.2.7. Geographic-position-assisted routing

6. Mobile Transport Layer - TCP Improvements (Book 1, Chapter 9)
6.1. Indirect TCP
6.2. Snooping TCP
6.3. Mobile TCP
6.4. Fast Retransmit/Recovery
6.5. Transmission/time-out freezing
6.6. Selective retransmission
6.7. Transaction – oriented TCP
6.8. TCP over 2.5/3G wireless networks

7. Wireless Application Protocol (WAP)(Book 2, Chapter 8)
7.1. WAP Application Environment (WAE) – User Agent, User Agent Profile (UAProf), Wireless Markup Language (WML), WML Script, Wireless Telephony Application (WTA)
7.2. WAP Push Architecture
7.3. Wireless Session Protocol(WSP)

    7.4. Wireless Transaction Protocol (WTP)

    7.5. Wireless Transport Layer Security (WTLS)

    7.6. Wireless Data Protocol (WDP)

    7.7. WAP Gateway

    7.8. MMS – Architecture, Transaction Flows, SMIL (Synchronized Multimedia Integrated Language), Interaction, Interoperability and Roaming, Device Management and Configuration, Digital Rights Management, OMA Digital Rights Management

8. Client Programming(Book2, Chapter 12)

    8.1. Hardware Overview,

    8.2. Mobile Phones and Features of Mobile Phones

    8.3. PDA

    8.4. Design Constraints in Application for Handheld Devices

    8.5. Recent Development in Client Technologies

9. Android Application Development (Only for LAB Work as an Internal Assessment)

    9.1. Setting up Android Development Environment

    9.2. Defining Application Using the Android Manifest File

    9.3. Managing Application Resources

    9.4. Designing User Interfaces With Layout

    9.5. Working with Fragments, Dialogs, Preferences, Files and Directories

    9.6. Android Software Development Process

    9.7. Designing and Developing Android Applications

    9.8. Testing and Publishing Android Applications

Teachers can create practical handbook on Android application Development using Book 3 or Book 3 itself can be used as a practical handbook for Android Programming.

Internal Assessment:

Students should be encouraged to do following activities as a part of continuous assessment.

- Programming Assignments
- Mini Project
- Case studies
- Seminars
- Survey Report / Informative Research Reports

External Examination:

- Frame and packet formats should not be asked.
- No questions on Android programming should be asked.

Reference Books:

Book 1: Mobile Communications by Jochen Schiller, Pearson
Book2: Mobile Computing Technology, Applications and Service Creation by Asoke K. Talukder, Hasan Ahmed, Roopa R Yevgal, McGraw Hill Education, Second Edition
Book3: Android Wireless Application Development Volume I: Android Essentials by Lauren Darcey, Shane Conder, Pearson
Book4: Hello, Android – Introducing Google's Mobile Development Platform, Ed Burnette, SPD
Book5:Principles of mobile computing second edition by hansmall wiley publication
Book6:Mobile computing principles by reza B'far by Cambridge publication

CA-602: Software Testing & Quality Assurance

Chapter 1: Software Testing and Introduction to quality

Introduction, Nature of errors, an example for Testing, Definition of Quality , QA, QC, QM and SQA , Software Development Life Cycle , Software Quality Factors

Chapter 2: Verification and Validation

Definition of V &V , Different types of V & V Mechanisms, Concepts of Software Reviews, Inspection and Walkthrough

Chapter 3: Software Testing Methods

Testing Fundamentals, Test Case Design, White Box Testing and its types, Black Box Testing and its types

Chapter 4: Software Testing Strategies

Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing

Chapter 5: Software Metrics

Concept and Developing Metrics, Different types of Metrics, complexity metrics

Chapter 6: Defect Management   **4**

Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related to Defects, Using Defects for Process Improvement

Chapter 7: Quality Improvement

Introduction, Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts,

Chapter 8: Software Quality Assurance

Concepts, Quality Movement, Background issues and SQA activities Software Reviews, Formal Technical Reviews, Formal approaches to SQA Statistical Quality Assurance, Software Reliability, SQA Plan, The ISO 9001 Quality Standard, Six sigma, **Informal Reviews**

Chapter 9: Quality Costs

Quality Cost Measurement, Utilizing Quality Costs for Decision-Making

Chapter 10: 9.Testing Tools (Introduction and execution only)

Junit, Apache Jmeter, Winrunner, Loadrunner, Rational Robot

Reference Books :
1) Software Engineering – A Practitioners Approach, Roger S. Pressman, Tata McGraw Hill
2) Software Engineering for Students- A Programming Approach, Douglas Bell, Pearson Education
3) Quality Management, 5th ed., Prentice-Hall, 2010. Donna C. S. Summers
4) Total Quality Management, Prentice Hall, 2003. Dale H. Besterfield
5) Software engineering: An Engineering approach, John Wiley. J.F.Peters, W.Pedrycz
6) Software testing by yogesh singh Cambridge publication
7) Software Testing and Quality Assurance Theory and Practice by KshirsagarNaik, PriyadarshiTripathy

Insertions:

Reference Books :

6) Software Testing and Quality Assurance Theory and Practice by KshirsagarNaik, PriyadarshiTripathy

CA-603: Embedded Systems

Chapter No.	Topic
1	**Embedded Systems overview** An embedded system, features of embedded system, components of embedded system,examples of embedded system application. Review of Microprocessor family, 8-bit Micro-controllers (Atmel), Architecture(Harvard and Van-Neuman Architecture), Instruction set, Memory organization, Design of target board, Interfacing techniques, Timers, Interrupts I/o pins, Timers, interrupts, serial interface. Processors in embedded systems (RISC, CISC)
2	**Real time system concepts** Foreground/ background systems, Critical section of code, Resourse, shared resourse,Multitasking, task, task switch, Kernel, scheduler, non-preemptive kernel, preemptive kernel, Reentrancy, round-robin scheduling, Task priority, static priority, dynamic priority, priority inversions, assigning task priorities, Mutual exclusion, deadlock, synchronization, event flags, intertask communication, Interrupts : latency, response, recovery, ISR processing time, NMI
3	**Modular programming concepts** Software design cycle, Parameter passing, Recursion,Dynamic allocation, Operating system fundamentals, multi user multi tasking OS, Tasks, Processes and Threads, Scheduling, communication and synchronization
4	**Writing software for embedded systems** The compilation process : compile, link, load, Cross compilers, Run-time-libraries : processor dependent, I/O dependent, system calls, exit routines, Writing a library, using alternative libraries, Porting Kernels C extensions for embedded systems
5	**Development environment and debugging tools** Assemblers, Compilers, Linkers, Loaders, Debuggers, Profilers & Test Coverage Tools, IDE's, Emulators, Logic Analyzer

Reference Books :
1   Kenneth J. Ayala The 8051 Microcontroller, Architecture, Programming And Application [Second Edition] Penram International, (1999).
2   M.A. Mazidi, J. G. Mazidi, R.D. Mckinlay The 8051 Microcontroller And Embedded Systems, Using Assembly and C ,Second Edition (2009) Pearson Education
3.   The 8051 Microcontroller Architecture, Programming and Applications K.J. Ayala, Penram Int. Pub.
4.   Embedded system design F. Vahid,T. Gargivis John Wiley and Sons
5.   Embedded system designAn Introduction to processes tools and Techni1ques A.S. Berger, CMP Books
6.   Computers as Components: Principles of Embedded Computer Systems Design Wayne Wolf Morgan Kaufmann

CA-604: Information Security And Audit

Objectives :-

- Understand some of the basic theory underlying computer security.
- Learn how access to systems, resources, and data can be controlled. Assess the design, placement, and quality of controls.
- Understand the basic issues in auditing computer security policies and mechanisms.

1. **Introduction to concept of Information Security**
   1.1. Computer Security Concepts
   1.2. Threats, Attacks, and Assets
   1.3. Security Functional Requirements
   1.4. A Security Architecture for Open Systems
   1.5. Computer Security Trends
   1.6. Computer Security Strategy
2. **Cryptographic Tools**
   2.1   Confidentiality with Symmetric Encryption
   2.2   Message Authentication and Hash Functions
   2.3   Public-Key Encryption
   2.4   Digital Signatures and Key Management
   2.5   Random and Pseudorandom Numbers
   2.6   Practical Application: Encryption of Stored Data
3. **User Authentication**
   3.1   Electronic User Authentication Principles
   3.2   Password-Based Authentication
   3.3   Token-Based Authentication
   3.4   Biometric Authentication
   3.5   Remote User Authentication
   3.6   Security Issues for User Authentication
   3.7   Practical Application: An Iris Biometric System
   3.8   Case Study: Security Problems for ATM Systems
4. **Access Control**
   4.1   Access Control Principles
   4.2   Subjects, Objects, and Access Rights
   4.3   Discretionary Access Control
   4.4   Example: UNIX File Access Control
   4.5   Role-Based Access Control
   4.6   Attribute-Based Access Control
   4.7   Identity, Credential, and Access Management
5. **Database Security**
   5.1   The Need for Database Security
   5.2   Database Management Systems

10. Operating System Security

11. Security Auditing

12. Legal and Ethical Aspects

Text Books:

1) Computer Security: Principles and Practice, 3/E, By William Stallings, Lawrie Brown, Pearson Education
2) Information Security: Principles and Practice, 2nd Edition, M. Stamp, Wiley Publication
3) Computer Security: Art and Science By M. Bishop, Pearson Education

CA-605 : Cloud Computing

Objectives:

1. Understanding the concept various service and deployment models cloud computing.

2. Discuss the concept of virtualization and data in cloud.

3. Introduce various security issues in cloud.

4. Providing exposures to some existing cloud platforms and architectures.

Unit I. Introduction to cloud computing

Definition, characteristics, components, Cloud service provider, the role of networks in Cloud computing, Cloud deployment models- private, public & hybrid, Cloud service models, multitenancy, Cloud economics and benefits, Cloud computing platforms - IaaS: Amazon EC2, PaaS: Google App Engine, Microsoft Azure, SaaS.

Unit II. Virtualization

Virtualization concepts , Server virtualization, Storage virtualization, Storage services, Network virtualization, Service virtualization, Virtualization management, Virtualization technologies and architectures, virtual machine, Measurement and profiling of virtualized applications. Hypervisors: KVM, Xen, VMware hypervisors and their features.

Unit III. Data in cloud computing

Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map-Reduce and extensions: Parallel computing, the map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce.

Unit IV. Cloud security

Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud. Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro - architectures; Identity Management and Access control, Autonomic security, Security challenges : Virtualization security management - virtual threats, VM Security Recommendations, VM - Specific Security techniques, Secure Execution Environments and Communications in cloud.

Unit V. Issues in cloud computing

Implementing real time application over cloud platform, Issues in Inter-cloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud.

Reference Books:

1. Enterprise Cloud Computing by Gautam Shroff,Cambridge publication
2. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India
3. Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication
4. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
5. Borko Furht, "Handbook of Cloud Computing", Springer
6. Venkata Josyula,"Cloud computing – Automated virtualized data center", CISCO Press
7. Greg Schulr,"Cloud and virtual data storage networking",CRC Press
8. Mark Carlson,"Cloud data management and storage", Mc Graw hill

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