

Solapur University, Solapur

M. C. A. Part - III

Syllabus (Semester – V and VI)
(Effective from June 2013)

MCA – III Semester V and VI Syllabus

M. C. A. Part – III Semester-V

Paper Code	Title of the Paper	Contact hours/week	Distribution of Marks for Examination			Credits
			Internal	University	Total	
MCA-501	Artificial Intelligence	04	30	70	100	04
MCA-502	Web Technology	04	30	70	100	04
MCA-503	Network Security	04	30	70	100	04
MCA-504	OPTIONAL COURSES	04	30	70	100	04
MCA-505	(GROUP-I, GROUP-II) SELECT ANY ONE GROUP	04	30	70	100	04
MCA-506	Practical - V	12	30	70	100	04
MCA-507	Project -V	02	30	70	100	04
Total		34	210	490	700	28

Group-I : MCA504 – Digital Image Processing

MCA505 - Mobile Computing

Group-II : MCA504 – Pattern Recognition

MCA505 - Real Time Systems

M. C. A. Part – III Semester-VI

Paper Code	Title of the Paper	Contact hours/week	Distribution of Marks for Examination			Credits
			Internal (Project Viva)	University (Project Viva)	Total	
MCA-601	Project - VI	02	50	200	250	10

MCA 501 – Artificial Intelligence

Unit 1. Introduction to Artificial Intelligence

The AI Problems, The Underlying Assumption, What is an AI Technique? (2)

Unit 2. Problems, Problem Spaces and Search

Defining the problem, as a state space search, production systems, problem characteristics, production system characteristics, Issues in the design of search programs. (2)

Unit 3. Heuristic Search Techniques

Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction Means-Ends Analysis. (4)

Unit 4. Knowledge Representation Issues

Approaches to Knowledge representation, Issues in Knowledge representation. (4)

Unit 5. Using Predicate Logic

Representing Simple Facts in Logic, Representing Instance and ISA Relationships, Computable Functions and Predicates, Resolution, Natural deduction. (4)

Unit 6. Representing Knowledge Using Rules

Procedural Versus Declarative Knowledge, Forward Versus Backward Reasoning, Matching. (4)

Unit 7. Statistical Reasoning

Probability and Bayes' Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. (4)

Unit 8. Weak Slot-and-Filler Structures

Semantic Nets, Frames. (4)

Unit 9. Strong Slot-and-Filler Structures

Conceptual Dependency, Scripts. (4)

Unit 10. Game Playing

Overview, The Minmax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening. (4)

Unit 11. Natural Language Processing

Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing. (4)

Unit 12. Expert Systems

Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition. (4)

Reference Books :

1. Artificial Intelligence by Elaine Rich, Kevin Knight, TMH, 2nd Edition.
2. Artificial Intelligence : Structures and Strategies for Complex Problem solving by George F Luger, 4th Edition, Pearson Education, Asia.
3. Introduction to Artificial Intelligence and Expert Systems by D W Patterson, PHI, 2nd Edition.

MCA 502 – Web Technology

1. Introduction to HTML – only basic structure and tags (upto table tag) of HTML, Overview of Java Script, Primitives, Date and Time, Operations and Expressions, Screen Output and Keyboard Input, Control Statement, Object Creation and Modification, Arrays, Functions, Constructors (10)
2. Servlet Basics, Basic Servlet Structure, Servlets Generating text/plain and text/html content, Packaging Servlets, The Servlet Life-Cycle (2)
3. Handling Client Request Form Data, Reading Form Data from Servlets, Handling Client Request, Reading Request Headers, Understanding HTTP/1.1 Request Headers, Changing the page according to how the user got there, Accessing the Standard CGI Variables (3)
4. Generating the Server Response, HTTP Status Codes, Specifying Status Codes, HTTP / 1.1 Status Codes, Using Redirections, HTTP Response Headers, Setting Response Headers from Servlets, Understanding HTTP / 1.1 Response Headers, Using Servlets to Generate JPEG Images (4)
5. Handling Cookies, Remembering Usernames and Passwords, Deleting Cookies, Sending and Receiving Cookies, Using Cookie Attributes, Differentiating Session Cookies from Persistent Cookies, Using Cookies to Remember User Preferences, Session Tracking, Need for Session Tracking, Session Tracking API, Encoding URLs Sent to the Client, Accumulating a List of User Data (4)
6. JSP Basic Syntax, HTML Text, HTML comments, Template Text, JSP Comment, JSP Expression, JSP Scriptlet, JSP Declaration, JSP Directives, JSP Action, JSP Expression Language Element, Custom Tag (Custom Action), Escaped Template Text, Using JSP Scripting Elements, Using Predefined Variables, XML syntax for Expressions, Scriptlets, Declarations and Directives, Using Scriptlets, Using Declarations, Using Page Directive, Using Standard Actions Tags – <jsp:plugin>, <jsp:forward>, <jsp:include>, Using JavaBeans in JSP pages – <jsp:useBean>, <jsp:getProperty>, <jsp:setProperty>, Sharing Beans, Use of Scopes and their Attributes (5)
7. Integrating Servlets and JSP in a Web Application (MVC Architecture for Web Applications), Implementing MVC with RequestDispatcher, Understanding Data Sharing

Between Servlets and JSP, JSP Expression Language, Accessing Scoped Variables, Bean Properties, Collections and Implicit Objects Using EL, Using EL Operators (5)

8. Structure of Web Applications and the Role of Deployment, Descriptor (web.xml) file, Declarative and Programmatic Security for Preventing Unauthorized Access to Resources in a Web Application, Servlet and JSP Filters, The Application Events Framework, Tag Library – Basics; Using JSTL – c:out, c:forEach, c:forTokens, c:if, c:choose, c:set, c:remove, c:import, c:url, c:param, c:redirect and c:catch Tags (10)

9. New Features of Servlets 3.0, Asynchronous Request Processing, FileUpload, Internationalization Features (2)

References:

1. Ivan Bayross, “Web Enabled Commercial Application Development Using HTML, DHTML, PERL, Java Script”, BPB Publications, Revised Edition
2. Marty Hall, Larry Brown, “Core Servlets and JavaServer Pages Volume – 1”, Pearson Education, 2nd ed.(2004)
3. Marty Hall, Larry Brown, Yaakov Chaikin, “Core Servlets and JavaServer Pages Volume – 2”, Pearson Education, 2nd ed.(2004)
4. RFC 2616 HTTP/1.1 Protocol
5. Servlet Specifications 3.0
6. “Web Technologies Black Book”, Dreamtech Press, Edition 2010

MCA 503 – Network Security

1. Introduction : Security Concepts, Threats and Risks, Attacks – Passive and Active Security Services, Confidentiality, Authentication, Non-Repudiation, Integrity, Access Control, Availability, Model for Internetwork Security, Internet Standards and RFCs (8)

2. Access Control Mechanisms : Access Matrix, HRU, TAM, ACL and capabilities, Access Control Models, Chinese Wall, Clark-Wilson, Bell-LaPadula, Non-Interference and Role Base Model (8)

3. Cryptography : Secret Key and Public Key Cryptosystems, Symmetric Ciphers, Block Ciphers and Stream Ciphers, DES, IDEA and Key Escrow, RSA and ElGamal, Secure Hash and Key management, Digital Signature and Non-repudiation, cryptanalysis (8)

4. Network Security : Objectives and Architectures, Internet Security Protocols, IP encapsulating Security Protocol, Network and Transport Layer Security (6)

5. Network Security Applications : Authentication Mechanisms – Passwords, Cryptographic authentication protocols, Smart Card, Biometrics, Digital Signatures and seals, Kerberos, X.509 LDAP Directory, Web Security - SSL Encryption, TLS, SET, E-mail Security, PGP's / MIME, IP Security (8)

6. Access and System Security : Intruders, Intrusion Detection and Prevention
Firewalls - Hardware Firewall, Software Firewall, Application Firewall, Packet Filtering, Packet Analysis
Proxy Servers - Firewall setting in Proxy, ACL in Proxy (8)

References :

- 1 William Stallings, "Network Security Essentials", Prentice-Hall.
- 2 Edward Amoroso, "Fundamentals of Computer Security Technology", Prentice-Hall.
- 3 Dorothy E. Denning, "Cryptography and Data Security", Addison-Wesley.
- 4 Peter J. Denning, "Computers under Attack", Addison-Wesley.
- 5 Douglas R. Stinson, "Cryptography: Theory and Practice", CRC Press.
- 6 D. Brent Chapman and Elizabeth D. Zwicky, "Building Internet Firewalls", O'Reilly and Associates

GROUP – I

MCA 504 (GROUP-I) – Digital Image Processing

1. Introduction

Digital image processing, Applications of digital image processing, Fundamental steps in digital image processing, Components of an image processing system. (4)

2. Digital image fundamentals

Image sampling and quantization, Some basic relationships between pixels, Linear and nonlinear operation (4)

3. Image enhancement in the spatial domain

Some basic gray level transformations
Histogram processing, Enhancement using arithmetic/logic operations
Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters (4)

4. Image enhancement in the frequency domain

Introduction to the Fourier transform and the frequency domain
Smoothing frequency-domain filters, Sharpening frequency domain filters
homomorphic filtering (6)

5. Image restoration

A model of the image degradation/restoration process
Noise models, Restoration in the presence of noise only-spatial filtering
Periodic noise reduction by frequency domain filtering (6)

6. Morphological image processing

Preliminaries, Dilation and erosion, Opening and closing,
The hit-or-miss transformation, Some basic morphological algorithms (6)

7. Image segmentation

Detection of discontinuities, Edge linking and boundary detection
Thresholding, Region-based segmentation,
Segmentation by morphological watersheds (6)

8. Representation and description

Representation, Boundary descriptors, Regional descriptors,
Use of principal components for description, Relational descriptors (4)

9. Object recognition

Patterns and pattern classes, Recognition based on decision- theoretic methods
Structural methods (4)

References :

1. Digital image processing by Gonzalez and Woods PHI
2. Image Processing, Analysis and Machine Vision: Milan Sonka, Vaclav Hlavac, Roger Boyle (Thomson Brooks / Cole Edition).
3. Fundamentals of Digital Image Processing: Anil K. Jain (Prentice Edition Hall of India)

MCA 505 (GROUP-I) – Mobile Computing

Mobile Computing

Unit 1. WIRELESS TRANSMISSION: Frequencies for radio transmission, Regulations. Signals, Antennas, Signal propagation-Path loss of radio signals, Additional signal propagation effects, Multipath propagation. Multiplexing-Space, Frequency, Time, Code division multiplexing. Modulation- Amplitude, Frequency, Phase Shift Keying, Advanced frequency and phase shift keying, Spread spectrum- DSSS, FHSS. Cellular System (6)

Unit 2 . MEDIUM ACCESS CONTROL: CSMA/CD , Hidden and exposed terminals, Near and Far terminals, SDMA, FDMA, TDMA- Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA, Reservation TDMA,MACA , Polling, CDMA. (8)

Unit 3. TELECOMMUNICATION SYSTEM:GSM – Mobile services, Architecture of a GSM System, Protocol Architecture, Radio Interface, Localization and calling, MTC, MOC, Handover, Security- Authentication, Encryption. (8)

Unit 4. WIRELESS LAN: Introduction, Infrared vs radio transmissions, architecture of an infrastructure based IEEE 802.11 and Ad-hoc networks, Protocol architecture, Physical Layer, Medium access control layer, Format of an IEEE 802.11 frame using DSS. MAC management- synchronization, power management, Roaming. Bluetooth Architecture, simple Bluetooth piconet. (8)

Unit 5. MOBILE NETWORK LAYER: Entities & terminology in Mobile IP, IP packet delivery agent discovery, Registration, IP in IP encapsulation, minimal encapsulation. Dynamic Host Configuration Protocol (DHCP). (8)

Unit 6. MOBILE TRANSPORT LAYER: Traditional TCP- Congestion control, Slow start, Fast retransmit/Fast recovery, implications on mobility. Classical TCP- Indirect TCP, Snooping TCP, Mobile TCP, Transmission/time out freezing, selective retransmission, Transaction oriented TCP. (8)

Reference Books:

- 1.Mobile communication (2 nd Edition) – John Schiller(Pearson Edition)
- 2.Wireless LAN: Peter T Davis, Craig R Mc Guffin (MGH International).

GROUP – II

MCA 504 (GROUP-II) - Pattern recognition

1. Introduction : Application of Pattern Recognition, statistical decision theory, Image processing and analysis (2)

2. Probability: Probability of Events, Random Variables, Joint Distribution and Densities, Moments of Random variables, Estimation of Parameters from samples, Minimum Risk Estimations. (8)

3. Statistical Decision Making : Baye's Theorem, Multiple Features, Conditionally Independent Features, Decision Boundaries Estimation of Error rates, Characteristic centers, Estimating the Composition of Populations. (6)

4. Non Parametric Decision Making : Histograms, Kernel and windows estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminant functions, minimum squared (8)

5. Clustering : Hierarchical clustering, partitioned clustering (6)

6. Artificial Neural Networks : Nets without hidden layers, nets with hidden layer, the Back-Propagation algorithm, Hopfield nets – an application : Classifying sex from facial images. (8)

7. Processing of Wave form and images : gray level scaling, transformations, equalizations, geometric image scaling and interpolations, logarithmic gray level scaling, the statistical significance of image features. (8)

References :

1. Earl Gose, Richard Johnsonbaugh and Steve Jost, Pattern Recognition and Image Analysis, PHI 1997
2. Fu. K. S., Syntactic Methods in Pattern Recognition, Acaemis Press 1974
3. Tray Y Young and Thomas W Calvers, Classification, Estimation and Pattern Recognition, American Elsevier Publication Company Inc. 1994
4. Duda R. O. and Hart P. E., Pattern Classification and Scene Analysis, John Wiley (1973)

GROUP – II

MCA 505 (GROUP-II) - Real Time Systems

1. Introduction : Issues in real-time computing, structure of a real-time system, performance measures for real time systems, estimating program run times, introduction to hardware components of real time systems (microcontroller, sensor and actuator, interrupts) (10)

2. Task Assignment and Scheduling : Pre-emptive, nonpreemptive, scheduling, classical microprocessor scheduling algorithms, rate-monotonic scheduling algorithm and preemptive earliest deadline first (EDF) algorithm, Allowing for precedence and exclusion conditions, using primary and alternative task, Introduction to IRIS tasks, task assignment and allocation algorithms, Utilization : Balancing algorithm, A next-fit algorithm for RM scheduling, A bin-packing assignment algorithm for EDF, A myopic offline scheduling (MOS) algorithm, fault-tolerant scheduling, (12)

3. Programming languages for real-time applications : Desired language characteristics, data typing, control structures, hierarchical decomposition, exception handling, overloading, multitasking, low-level programming, tasks scheduling, timing specifications, programming environments, run-time support, real time database, real-time Vs. relative databases, main memory databases, transaction priorities, transaction aborts, concurrency control issues, disk scheduling algorithms, database for hard real-time systems (12)

4. Real-time communication : Network topologies, network architecture issues, protocols (Contention-bases protocols, token-based protocols, stop and Go multi hop protocol, polled bus protocol, hierarchical round robin protocol, deadline-based protocols, fault-tolerant routing) fault-tolerance techniques. Introduction to fault types, fault detection, hardware, software information and time redundancy, data diversity, Introduction to reliability evaluation and clock synchronization for hardware and software redundancy. (12)

References :

1. C. M. Krishna and Kang G. Shin – Real-Time Systems, McGraw Hill International Editions, Computer Science Series, 1997
2. J. E. Cooling – Software Design for real-time systems, Chapman and Hall pub.
3. John B. Peatman – Design with Micro Controllers, McGraw-Hill International

MCA 506 – Practical – V

The practical course will contain 20 practical assignments covering syllabi of all theory papers

MCA 507 - Project and Viva - V

Project work.

M. C. A. Part – III Semester-VI

Paper Code	Title of the Paper	Contact hours/week	Distribution of Marks for Examination			Credits
			Internal (Project Viva)	University (Project Viva)	Total	
MCA-601	Project - VI	02	50	200	250	06

GENERAL INSTRUCTION REGARDING PREPARATION OF PROJECT REPORT FOR MCA-III SEM-VI

TYPING

- (a) The typing shall be standard 12 pts in double spaced
- (b) Margins must be Left 2 inches Right 1.5 inches
Top 2 inches Bottom 1.5 inches
- (c) Paper A4 size Bond Paper

COPIES

Two hard-bound copies (Black Rexine with Golden Embossing as per format displayed herewith) One original and one clean Xerox Copy.

FORMAT FOR TITLE PAGE AND FOR EMBOSSING

<p style="text-align: center;">PROJECT REPORT ON <i>NAME OF THE SYSTEM</i></p> <p style="text-align: center;"><i>NAME OF THE COMPANY</i></p> <p style="text-align: center;">BY <i>NAME OF STUDENT</i></p> <p style="text-align: center;">Department of Computer Science Solapur University, Solapur</p> <p style="text-align: center;">MASTER IN COMPUTER APPLICATION 200__ - 200__</p>
--

The Guidelines regarding the documentation and scope of project are mentioned here below:

MCA-III SEM-VI (COMMERCIAL SYSTEM PROJECTS)

Project Report should be submitted in following format for Commercial Application

Projects viz. Payroll, Sales, Purchase, Inventory, Book Shop, Examination system etc.

Where VB, Access, Oracle, ASP and Java is used.

2 Blank Pages at beginning

Title Page

Certificate from Company

Certificate from Guide and Head of Department

Acknowledgement

Index with printed Page Numbers

CHAPTER 1 : INTRODUCTION

- 1.1 Company Profile
- 1.2 Existing System and Need for System
- 1.3 Scope of Work
- 1.4 Operating Environment – Hardware and Software

CHAPTER 2 : PROPOSED SYSTEM

- 2.1 Proposed System
- 2.2 Objectives of System
- 2.3 User Requirements

CHAPTER 3 : ANALYSIS & DESIGN

- 3.1 Data Flow Diagram (DFD)
- 3.2 Entity Relationship Diagram (ERD)
- 3.3 Data Dictionary
- 3.4 Table Design
- 3.5 Code Design
- 3.6 Menu Tree
- 3.7 Menu Screens
- 3.8 Input Screens
- 3.9 Report Formats
- 3.10 Test Procedures and Implementation

CHAPTER 4 : USER MANUAL

- 4.1 User Manual
- 4.2 Operations Manual / Menu Explanation
- 4.3 Forms and Report Specifications

Drawbacks and Limitations

Proposed Enhancements

Conclusions

Bibliography

ANNEXURES :

ANNEXURE 1 : INPUT FORMS WITH DATA

ANNEXURE 2 : OUTPUT REPORTS WITH DATA

ANNEXURE 3 : SAMPLE CODE

2 Blank Pages at the end.

Project report should be submitted in following format for project using OOAD, Embedded System, WAP and other technologies and Web Deployed Systems where C, C++, J2EE, .NET, OOAD and JAVA, SDK's, API's are used.

2 Blank Pages at beginning

Title Page

Certificate from Company

Certificate from Guide and Head of the Department

Acknowledgement

Index with printed Page Numbers

CHAPTER 1 : INTRODUCTION

- 1.1 Company Profile
- 1.2 Existing System and Need for System
- 1.3 Scope of Work
- 1.4 Operating Environment – Hardware and Software
- 1.5 Detail Description of Technology Used

CHAPTER 2 : PROPOSED SYSTEM

- 2.1 Proposed System
- 2.2 Objectives of System
- 2.3 User Requirements

CHAPTER 3 : ANALYSIS & DESIGN

- 3.1 Object Diagram
- 3.2 Class Diagram
- 3.3 Use Case Diagrams
- 3.4 Module Hierarchy Diagram
- 3.5 Component Diagram
- 3.6 Deployment Diagram (in case of Web Deployment)
- 3.7 Module Specifications
- 3.8 Interface Diagram (in case of WAP and Embedded Systems)
- 3.9 Web Site Map Diagram (in case of Web Site)
- 3.10 User Interface Design (Screens etc.)
- 3.11 Table specifications (in case back end is a database)
- 3.12 Test Procedures and Implementation

CHAPTER 4 : USER MANUAL

- 4.1 User Manual
- 4.2 Operations Manual / Menu Explanation
- 4.3 Program Specifications / Flow Charts

Drawbacks and Limitations

Proposed Enhancements

Conclusions

Bibliography

ANNEXURES :

ANNEXURE 1 : USER INTERFACE SCREENS

ANNEXURE 2 : OUTPUT REPORTS WITH DATA (if any)

ANNEXURE 3 : SAMPLE PROGRAM CODE (which will prove sufficient development is done by the student) and 2 Blank Pages at the end.