

M.C.A.  
I to III Year

Prospectus No. 101726

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(FACULTY OF ENGINEERING & TECHNOLOGY)

## PROSPECTUS

Prescribed for

MASTER IN COMPUTER APPLICATION

FIRST, SECOND & THIRD YEAR M.C.A.

Examinations, 2009-2010

BI-ANNUAL PATTERN



2009

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**SYLLABUS  
PRESCRIBED FOR  
THREE YEAR POST GRADUATE DEGREE COURSE  
MASTER IN COMPUTER APPLICATIONS  
FIRST YEAR  
SEMESTER : FIRST**

**1 MCA 1 / 1 CS 1 COMPUTER ORGANIZATION**

Unit I	Chapter Objectives, Evaluation of Computers and computer generations, Technological trends, Measuring performance, speed up, Amdahl's law, Von Neumann machine architecture, Functional units and components in computer organization, Program development tools, Operating systems.
Unit II	From Electron to Bits, Binary representation of positive integers, Negative integers, Fixed point arithmetic operations on positive and signed (Negative) integers, Floating-Point numbers (IEEE 754 standard) and operations, BCD arithmetic operation, Design of ALU, Bit slice processors.
Unit III	Concept of instruction formats and instruction set, instruction set types, types of operands and operations, Generation of memory addresses and addressing modes, Subroutine nesting using stacks to implement subroutine calls and calling conventions, Processor organizations, Register organization, Stack based organizations, Encoding of machine instructions, General features of RISC and CISC instruction sets, modern processors convergence of RISK with CISC, Processor microarchitecture-I - Fundamental concepts for data path implementation, Processor microarchitecture-II - Data path implementation, microprogrammed execution, recent innovations in execution unit design.
Unit IV	Instruction pipeline, instruction pipeline hazards, overcoming hazards using a pipeline with forwarding paths, instruction set design influence on pipelining, example of pipelined CISC processor, example of pipelined RISC processor, VLIW (Very Long Instruction Word) processors, Vector processors, Multithreaded processors, Compilation techniques support to instruction level parallelism, Extracting parallelism.
Unit V	Some basic concepts, memory hierarchy, internal organization of semiconductor main memory chips - RAM and ROM, semiconductor main memories - RAM, semiconductor Read-Only memories - ROMs, speed, size and cost, secondary storage magnetic ferrite core memories, optical disks CD-ROM memories, data caches, instruction caches, and unified cache,

features describing a cache, cache implementations, multilevel caches.

Unit VI	Virtual memory organization, mapping functions for translating the program pages in virtual to physical addresses space, partitioning, segmentation (superpages or page blocks) partitioning of virtual address space in to segment and page address, demand paging and swapping, cache and virtual swapping, cache and virtual memory, inverted page tables concept, protection between programs running on the same system, accessing I/O devices, programmed I/O, interrupts, direct memory access DMA, bus arbitration, interface circuits, I/O interfaces, I/O processors, external I/O devices.
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**Text Book :** Computer Architecture by Micholus Carter & Rajkamal, Schaum Series Pub.

**1 MCA 2 / 1 CS 2 PROBLEM SOLVING USING C++**

Unit I.	Objects & Classes in C++ : Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects, C++ String class.
Unit II.	Operator overloading : Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers & arrays. Pointers & functions. new & delete operators. Pointers for objects.
Unit III.	Inheritance in C++ : Derived class & base class, Derived class constructors, Function overloading, class hierarchies, Public and private inheritance, Multiple inheritance. Containership : classes within classes.
Unit IV.	Virtual functions concepts, Abstracts classes & pure virtual functions. Virtual base classes, Friend functions, Static functions, Assignment and copy initialization, the this pointer. Dynamic type information.
Unit V.	Streams & Files in C++ : Stream classes, stream errors, disk file I/O with streams, File pointers, Error handling in file I/O. File I/O with members functions, overloading the extractions & insertion operators, Memory as a stream object, command-line arguments. Multifile programs.
Unit VI.	Function Template, Class templates, Exception syntax, Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers, Iterates, Specialized iterates, Associative containers. Function objects.

**Text-Book :**

1. Savitch: Problem Solving using C++ (Addison Wesley) Low-Priced Edition.

**References :**

1. Robert Lafore Object-Oriented Programming in C++ (Galgotia)
2. Herbert Schildt C++ : Complete Reference (TMH)
3. Bjarne Stroustrup C++ Programming Language (Addison-Wesley)
4. Venugopal Mastering C++ (TMH)
5. Lipmann C++ Primer (Addison-Wesley)

**1MCA2 / 1 CS 2 LAB: LIST OF PROGRAMS**

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

- 1 Write a C++ program to implement a stack with its constructor and two member functions PUSH and POP
- 2 Write a C++ program to find product of two same numbers from 0 to 9 stored in an object array of 10 objects and then free the memory space occupied by an object array
- 3 Write a C++ program to overload minus operator as an unary and binary operator
- 4 Write a C++ program using friend operator function to overload plus binary operator
- 5 Write a C++ program to calculate the circumference of an earth (subclass) after getting distance of it measured from sun from planet (super class)
- 6 Write a C++ program for an inventory that stores the name of an item, the number on hand, and its cost. Include an inserter and an extractor for this class
- 7 Write a C++ program that creates an output file, writes information to it, closes the file and open it again as an input file and read the information from the file
- 8 Write a C++ program that counts number of words in a file
- 9 Write a C++ program to create an abstract class area having an abstract function get Area which will find an area of derived classes rectangle and triangle
- 10 Write a C++ program to create a generic function that swaps the values of the two variables it is called with"

**1MCA3 / 1 CS 3 COMPUTER ORIENTED STATISTICAL METHODS****UNIT-I: Introduction**

Definitions : Websters, secrists, Gronton and Cowden definitions of statistics

Improtance of statistics

Scope of statistics : Industry, Economy, Planning, medical science, Computer Science etc.

Limitations of statistics.

General principles of classification of data.

Construction of Frequency distribution, cummulative frequency distribution, relative frequency distribution. Graphical representation of frequency distribution.

Diagrammatic representation : Simple bar, subdivided bar, pie diagram.

Numerical Problems.

**UNIT-II : Measures of central Tendency & Measures of dispersion:**

Concept of central tendency, criteria for good measures of central tendency.

Arithmetic mean for grouped and ungrouped date, properties of a.m., combined mean, weighted mean, merits and demerits. Median, mode, G.M., H.M. for grouped & ungrouped data with its merits & demerits.

Partition values : quartiles, deciles, percentiles

Numerical problems on central tendency.

Concept of dispersion criteria for good measures of dispecrsion.

Measures of dispersion : Range, quartile deviation, mean deviation, S.D. for grouped & ungrouped data with its merits & demerits Variance : Definition for grouped & ungrouped data, combined variance, co-efficient of Dispersion, co-efficient of variation. Numerical problems on measures of dispersion.

**UNIT-III : Moments, measures of Skewness and Kurtosis correlation**

Raw & Central moments : for grouped & ungrouped data (upto first four moments) & their relationships. Skewness, measures of skewness, co-efficient of skewness, bempirical relation between mean, mode, median. Pearson's & Bowley's co-efficient of Skewness. Kurtosis & types of kurtic curves, co-efficient at Kurtosis based on moments.

Numerical problems on moments, co-efficient of skenmen & co-efficient of Kurtosis.

Unit-IV Corelation : Concept of correlation for bivariate data, scatter diagram, positive, negative & no correlation, cause and effect relationship.  
Karl pearson's co-efficient of correlation( $r$ ), limits at  $r$  and interpretation of  $r$ , assumption on  $r$ .  
Effect of change of origin & scale on  $r$ , independence of variables.  
Spearman's Rank correlation, repeated rank correlation.  
Numerical problems on karl pearsons & spearman's rank correlation co-efficient.

UNIT-V : Regression :  
Concept of regression & linear regression  
Derivation of regression lines by method of least squares.  
Properties of regression co-efficients.  
Linear and Non-linear regression : Fitting of second degree curve & curve  $y=abx$  by least square method.  
Numerical problems on linear & non-linear regression.  
Multiple regression by yule's notations (for tri-variata data)  
Multiple correlation & partial correlation.

UNIT-VI: Time series :  
Definition of Time series & uses of time series  
Components of Time series, Additive & multiplicative models.  
Methods of estimating trend by moving average method graphical method, semiaverage method & by least square methods.  
Numerical problems on Time Series.

#### Text Books:

J.N. Kapoor : Mathematical Statistics (MCG)  
Trivedi : Probability and Statistics with Computer Science Applications (TMH)

#### References:

1. Statistical Methods (An Introductory Text) : J. Medhi
2. Modern Elementary Statistics : J.E. Freund
3. Statistical Methods : S.P. Gupta
4. Fundamentals of Statistics : Goon, Gupta, Dasgupta

#### IMCA3 / 1 CS 3 Practicals on Statistical Methods:

Minimum 12 practicals to be performed throughout the semester based on following (using C or C++ language).

1. Construction of frequency distribution, graphical methods & diagrammatic representation.

2. Problems on measures of Central Tendency.
3. Problems on measures of dispersion.
4. Problems on moments, measures of Skewness and Kurtosis.
5. Computation of correlation co-efficient for bivariate data.
6. Fitting of linear & non linear regression lines
7. Computation of rank correlation co-efficient
8. Problems on time series .

#### IMCA4 / 1 CS 4 PRINCIPLES OF MANAGEMENT

(8 hours/unit)

- UNIT I Introduction : Definition and concepts of management, Importance of management . Various management functions & control, responsibilities. Human resources planning , Decision-making, Trade unions & collective bargaining.
- UNIT II Organization planning, design and development: Production resources, Production planning, types of production system, production systems, production control.
- UNIT III Product design & development : Introduction, design of the product, New product development; Material planning and control. Inventory control technique .
- UNIT IV Maintenance and system reliability: Concepts and Objectives of maintenance. Failure analysis, Reliability Maintenance system & Classification. Maintenance planning, TQM ISO 9000 and Quality audit.
- UNIT V Marketing management : Introduction, marketing planning . Consumer behavior, product management, Pricing & promotion decision. Financial planning. Source of finance.
- UNIT VI Project Management: Concepts and importance of project, Project implementation, MIS. MIS meaning and objectives. Types of data, methods of data collection, analysis and presentation of data. Editing, reporting and presentation of data, Decision options.

#### Text book :

A.K.Gupta, J.K. Sharma : Management of Systems (Macmillan)

#### References :

1. Appleby : Modern Business Administration, 6/e (Macmillan)
2. Tritaphy & Reddy : Principles of Management, 2/e (TMH)
3. Gupta, Sharma et : Principles of Practices of Management (Kalyani)

**1MCA5 / 1 CS 5 COMMUNICATION SKILLS**

- Unit I: Comprehension - word study :-  
Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage.  
Skimming for general ideas, Contextual vocabulary, Error detection, Note making and Location of argument from text, Ability to answer inferential, factual and personal response.
- Unit-II Comprehension - - Structure study :-  
Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.
- Unit III Theoretical background - importance of communication, its process, model of communication its components & barriers. Types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content.
- Unit IV Specific formats for written communication like - business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Letter writing, Preparation of Curriculum – Vitae, Composing messages-telegrams, telex, fax and e-mail Writing memos, agendas and notices of meetings, Preparing advertisements.
- Unit-V Oral communications - Important objectives of interpersonal skills, Verbal communication, its significance, face to face communications, group discussion and personal interviews. Voice modulation and logical argument, Comprehension of text at normal reading speed. Listening skill and timely response, Participation and contribution to discussion, Command over language Formal and informal style of communication, Body language.

**Books Recommended :**

- 1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
- 2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.

- 3) Curriculum Development Centre, TTTI WR, Bhopal : A Course in Technical English, Somaiya Publication Pvt. Ltd.
- 4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

**COMMUNICATION SKILLS LABORATORY****Objective :**

On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation.

The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

**Text Book :** Norman Lewis : Word Power Made Easy

<http://www.teachingenglish.org.uk>

**1MCA 6 / 1 CS 6 COMPUTER LABORATORY-I**

1. Introduction to Windows.
2. Introduction to MS-Word.
3. Introduction to MS-Excel.
4. Introduction to MS-PowerPoint.
5. Introduction to MS-Access
6. Introduction to Tally.
7. Introduction to MS-Internet Explorer.

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**2 MCA 1 / 2 CS 1 DATA STRUCTURES & ALGORITHMS**

- Unit-I** Data structures basics, Mathematical/algorithmic notations & functions, Complexity of algorithms, Subalgorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.
- Unit-II** Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sparse matrices.
- Unit-III** Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two-way linked lists.
- Unit-IV** Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks, Recursion. Tower of Hanoi problem. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues.
- Unit-V** Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes: threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort. Path length & Huffman 's' algorithm. General trees.
- Unit-VI** Graph theory, sequential representation of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing.

**Text Book:**

Seymour Lipschutz: "Theory & Problems of Data Structures", Schaum's Outline Series (McGraw-Hill) Int. Editions.

**References:**

1. Ellis Horowitz, Sartaj Sahni – Fundamentals of Data Structures (CBS Publications)
2. Trembley, Sorenson:- An Introduction to Data Structures with Applications. (TMH)
3. Kutty: Data Structures using C++ (PHI)
4. Bhagat Singh, Naps : Introduction to Data Structures (TMH)

**DATA STRUCTURES-LABORATORY**

The sample list of program is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected out comes. Further, C, C++ or Java may be used as the programming language.

1. Write an application to implement Tower of Hanoi Problem Algorithm.
2. Write an application to implement Abstract data type stack
3. Write an program to evaluate Post fix expression using stack
4. Write a program to implement Abstract data type queue.
5. Write a program to implement singly linked list that performs various operation such as insertion, deletion, searching a node in linear linked list.
6. Write a program to implement Preorder Traversal of a binary tree.
7. Write a Program to search a given element using Binary Search.
8. Write a Program to implement Selection Sort.
9. Write a Program to implement Merge Sort.
10. Write a Program to Perform insertion or search in a specified level of a stack implemented tree- structured symbol table.

**2 MCA 2 / 2 CS 2 OBJECT ORIENTED PROGRAMMING**

- Unit-I** Introduction, Software development, life-cycle approach, Software requirement specifications, Algorithms, VB Net projects, Designing objects, classes & applications, object relationships, Class design examples, class code in VB Net
- Unit-II** VB Net language, CLR, variables, expressions, statements, blocks, structured variables & enumerations. Classes, object orientation & variables, control structures, selection structures, repetitions, Subs, functions & parameters, errors & exception handling, scope.
- Unit-III** Data & object structures, organizing the data, arrays, other data structures, collections, inheritance in VB, code inheritance, interface inheritance, inheriting the data structures, Visual inheritance, polymorphism.
- Unit-IV** Winform applications : Structure of application, Winform basics, user interface code & the form designer, tools for creating a user interface, dialog boxes & the other user interface options, other form styles, control collection, delegates and event handlers, visual inheritance.
- Unit-V** Windows controls, accessing controls, command control, Simple input controls, list controls, manipulating the controls at runtime. Graphics in Winform programs, object modeling : application structure, real worlds object modeling with object

- relationships, software patterns.
- Unit-VI Storing application data, computer files, Windows registry, file storage, structured data, Serialization. Databases in Visual Basic. Net Object oriented database systems, Net support for relational database systems, data access in a three tiered system, reading & writing data.

**Text Books:**

Alisstair McMonnies : Object Oriented Programming in Visual Basic.NET, Pearson Education.

**References:**

1. Hamilton J.P. : OOP with Visual Basic.NET, O'Reilly Media Inc.
2. Reynolds-Haertle R.A. : OOP with Visual Basic.NET & Visual C#.NET, Microsoft Press.
3. Michael Halvorson : Microsoft Visual Basic.NET Step by Step, Microsoft Press.
4. Francesco Balena : Programming Microsoft Visual Basic.NET, Microsoft Press.

**2 MCA 2 / 2 CS 2 Object Oriented Programming Labs:**

Minimum ten programming assignments should be completed based on above syllabus.

**2 MCA 3 / 2 CS 3 SYSTEM ANALYSIS & DESIGN**

- UNIT I. Introduction : System Analysis & Design concepts. Role of system analyst. Review of System DLC. Organization as systems. Levels of management culture. Project fundamentals. Feasibility study. Activity planning & control. Managing analysis & design activities.
- UNIT II. Sampling and investigating hard data. Interviewing. Planning & conducting interview & reporting. Joint application design. Using questionnaires. Planning designing and administering the questionnaire.
- UNIT III. Coservation of a decision-makers behavior and office environment. Prototyping : User reactions. Approaches to prototyping & developing prototype. Data flow aproach to requirements. Developing DFDs. Logical & Physical DFDs. Examples of DFDs.
- UNIT IV. Data dictionary concept. Data repository. Creating & using data dictionary. Overview of process specifications. Structured English, Decision tables/trees. Decision support system & decision making concepts relevant to DSS. Semi structured decisions. Multiple-criteria decision-making.

- UNIT V. System Proposal : Ascertaining hardware/software needs. Identifying & forecasting cost/benefit & comparing cost/benefit. Writing and presenting the systems proposals. Principles of Delivery.
- UNIT VI. Output Design Objectives. Designing printed output, Screen output. Input Design objectives. Form Design. Screen Design for input. Introduction to OOSAD. : Object-Oriented Analysis. Object-Oriented Design.

**Text-book :**

Kenneth E.Kendall & : "System Analysis and Design"  
Julie E.Kendall (Pearson Education) 3/e

**References :**

1. Yeates "System Analysis & Design" (Macmillan)
2. J.Fitzgerald & A.Fitzgerald. "Fundamentals of System Analysis & Design" (John-Wiley) 3/e
3. Edward "System Analysis & Design" (McGraw-Hill)
4. Whiltlen, Bentley, Barlow "System Analysis & Design Methods" (Galgotia) 2/e.

**2MCA 3 / 2 CS 3 Labs :** 8 to 10 Examples of SAD from text book covering each unit of syllabus, using any available SAD tool, as from one available with text book.

**2MCA 4 / 2 CS 4 DATA COMMUNICATIONS**

- Unit-I : Data communication concepts, uses and applications. Telephone : Voice communication networks, Switches, PBX cellular technologies, Fax. IVR, Voice Mail.
- Unit-II : Hardware; network architecture, Hosts, Clients, Circuits, Special purpose Communication Devices, FEP, Multiplexers, Protocol Converters, Line adapters.
- Unit-III : Data transmission : Coding, Transmission modes, Band width, Modulation, Modem : Types and Standards, PAM & PCM techniques, Connector cables.
- Unit-IV : OSI model, MAC protocol; Controlled & contention-based, Error control in networks, Data link Protocols : asynchronous & synchronous Transmission efficiency.
- Unit-V : Network Layer : Topologies. Network routing, Network Standards and network protocols : TCP/IP, IPX/SPX, X.25 & GOSIP protocols.
- Unit-VI : LANs : uses and types, LAN components. Ethernet :

topology, MAC, types, Token rings : topology, MAC, types, Other types of LANs, MAP (IEEE 802.4)., ArcNet, Apple Talk.LAN performance improvement, selecting a LAN.

**Text Book :**

1. J.Fitzgerald & A Denis Business Data Communication & Networking, (5/e) (John Wiley & Sons)

**References:**

1. Schweber: Data Communication (McGrawHill)
2. Miller : Digital & Data Communication (Jaico)

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**2 MCA 5****BUSINESS SYSTEMS**

- Unit-I Introduction : Nature of business, objectives, components of business, environment of business system, business system and its sub-systems, forms of legal ownership : sole proprietorship, partnership organisation, company form of organisation. Social responsibilities of business.
- Unit-II Company Management : Structure of company management, patterns and problems of company management, company meetings & resolutions, company office - its organisation and management. Business combinations, Government & business.
- Unit-III Production functions : Plant location, factory planning, production control and cost control, Budgets and budgetary control, purchasing and storekeeping.
- Unit-IV Personnel functions : Personnel management; definition, role of personnel manager, job evaluation, merit rating. Industrial relations, Trade Unionism, employee remunerations, wage payments, incentives & wage policies.
- Unit-V Financial functions : Financial planning, various sources of finance, institutions of industrial finance. Securities market.
- Unit-VI Marketing functions : Marketing & its function, transport, selling or distributions of goods, channels of distribution, salesmanship, advertising and promotion.

**Text Book :**

M.C.Shukla : Business Organisation & Management, S. Chand & Company.

**References:**

1. P. Gopalkrishnan : Materials Management, PHI.
2. Reddy & Gulshan : Business Organisation & Management, S. Chand

& Company.

3. R.C.Appleby : Modern Business Administration, 6/e, Macmillan.

**2MCA 6****COMPUTER LABORATORY-II**

This lab. is based on Unix/Linux Operating System.

The topics to be covered include :-

- 1) Unix commands,
- 2) General purpose utilities & editors,
- 3) The shell & shell programming,
- 4) Communication & electronic mail,
- 5) TCP/IP networking,
- 6) Internet with Linux/Unix.

**Minimum 2 experiments on each topic.****Text book :-**

S.Das : Unix : Concepts & Applications (TMH)

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Three Year Post Graduate Course  
Master in Computer Applications (MCA)  
SEMESTER PATTERN  
**FIRST YEAR SEMESTER-I**

Sr. No.	Sub. Code No.	Subject	Teaching Scheme		Total periods/ week	Duration of Papers (Hrs)	THEORY		Examination Scheme			PRACTICAL		Pass	
			L	P			Max. Marks Theory Papers	Max. Marks College Assessment.	To- tal	Min. pass marks	Max. ks	Max. Mar- College Assessment	To- Marks		Min. tal Marks
1.	1 MCA 1	Computer Organisation	4	-	4	3	80	20	100	40	--	--	--	--	
2.	1 MCA 2	Problem Solving using C++	4	2	6	3	80	20	100	40	25	25	50	25	
3.	1 MCA 3	Computer Oriented Statistical Methods	4	2	6	3	80	20	100	40	25	25	50	25	
4.	1 MCA 4	Prinples of Management	4	-	4	3	80	20	100	40	--	--	--	--	
5.	1 MCA 5	Communication Skills	4	2	6	3	80	20	100	40	25	25	50	25	
6.	1 MCA 6	Computer Lab.-I	-	4	4	-	--	--	---	--	50	50	100	50	
<b>TOTAL</b>			20	10	30				500				250		

**GRAND TOTAL : 750**

**FIRST YEAR SEMESTER-II**

1.	2 MCA 1	Data Structures & Algorithms	4	2	6	3	80	20	100	40	25	25	50	25	
2.	2 MCA 2	Object Oriented Programming	4	2	6	3	80	20	100	40	25	25	50	25	
3.	2 MCA 3	Systems Analysis & Design Methods	4	2	6	3	80	20	100	40	25	25	50	25	
4.	2 MCA 4	Data Communications	4	-	4	3	80	20	100	40	--	--	--	--	
5.	2 MCA 5	Business Systems	4	-	4	3	80	20	100	40	--	--	--	--	
6.	2 MCA 6	Computer Lab.-II	-	4	4	-	--	--	---	--	50	50	100	50	
<b>TOTAL</b>			20	10	30				500				250		

**GRAND TOTAL : 750**

**\*# ORDINANCE NO.5 OF 1996**  
**Examinations leading to the Degree of Master in**  
**Computer Application (Biannual pattern)**  
**(Three Year Course) Ordinance,1996**

Whereas it is expedient to prepare a new Ordinance for Examinations leading to the Degree of Master in Computer Application (Bi-annual pattern)(Three Year Course) for the purposes hereinafter appearing, the Management Council is hereby pleased to make the following ordinance.

1. This Ordinance may be called "Examinations leading to the Degree of Master in Computer Application (Bi-annual pattern) (Three Year Course) Ordinance,1996".
2. This ordinance shall come into force w.e.f. the sessions :
  - i) 2007-2008 for First Year,
  - ii) 2008-2009 for Second Year, and
  - iii) 2009-2010 for Third Year
3. Subject to their compliance with the provisions of this Ordinance and other ordinances in force from time to time, the following person shall be eligible for admission to MCA.
  - (a) Graduate in any Discipline with minimum 50% marks and Math upto 10+2 level (5% Relaxation for B.C.)
  - (b) A person passing a PGDCS Exam. of Amravati University, satisfying the condition given in "a" above are eligible to take admission directly at second year of MCA(subject to condition of availability of seats, in total intake capacity) subject to condition that he will pass the subject heads of 1st MCA not covered at PGDCS level.
4.
  - (i) Duration of the course shall be three academic years.
  - (ii) Courses of First year MCA, Second year MCA and Third year MCA are divided into two parts every year i.e. part-I and part-II and the University shall held Examination in Winter and in Summer every year for both the Part-I & II.
  - (iii) The main Examination of Part-I shall be held in Winter & the Main Examination of Part-II shall be held in Summer every year. The Supplementary examination for Part-I shall be held in Summer and the Supplementary Examination for Part-II shall be held in Winter every year.

\* As Approved by the Management Council, dated 15.5.1996

#As amended by Ordinance Nos. 20/2000, 2/2003, / & 9/09

5. For purposes of instruction and examination the student shall study sequentially.
6. The period of academic session/term shall be such as may be notified by the University.
7. The Examinations shall be held at such places and on such dates as may be notified by the University.
8. Subject to his/her compliance with the provisions of this Ordinance and of other Ordinances (Pertaining to Examinations in General) in force from time to time, the applicant for admission, at the end of the course of study of a particular term shall be eligible to appear at it, if,
  - i) He/She satisfied the condition in the table and the provision thereunder.
  - ii) He/She was prosecuted a regular course of study in the University/College affiliated to the University.
  - iii) He/She has in the opinion of the Head of the Department/Principal shown satisfactory progress in his/her studies.

Name of Exam	The student should have passed the examination of	The student should have completed the session / term satisfactorily
1.	2.	3.
First Year MCA Part-I First Year MCA Part-II	The qualifying Examination mentioned in para-3	First Yr. MCA Part-I First Yr. MCA Part-I & II
Second Year MCA Part-I Second Year MCA Part-II		Second Year MCA Part-I Second Year MCA Part I & II
Third Year MCA Part - I Third Year MCA Part - II	Shall have cleared Ist of MCA & qualified for admission to Third Year as per para-4	Third year MCA Part-I Third Year MCA Part-I & II

9. The paper and practical in which an examinee is to be examined, the maximum marks for these and the minimum pass marks which

an examinee must obtain in order to pass in the subjects and the examination shall be as per Appendix-A.

10. i) The scope of the subject is as indicated in the syllabus.  
ii) The medium of instruction and examination shall be English.
11. There shall be no classification of examinees successful in First Year MCA Part-I examination, First Year MCA Part-II exam., Second Year MCA Part-I exam. and Second Year MCA Part-II exam., Third Year MCA Part-I and Third Year MCA Part-II exam separately.
12. Examinees who are successful in Third Year MCA Part-II examination and all other five previous examinations and have obtained not less than 60% marks in aggregate shall be placed in First Division & those who have obtained less than 60% shall be placed in Second Division.
13. An examinee at First Year MCA Part-I, First Year MCA Part-II, Second Year MCA Part-I and Second Year MCA Part-II, Third year MCA Part-I and Third year MCA Part-II examination shall have to option of not being declared successful; at the examination in case he/she does not secure a minimum of 50% marks at the examination. The option will have to be exercised every time an application is submitted to any of these examinations and shall be on the proforma printed on the application form itself. Once exercised, the option shall be binding upon the examinee and shall not be revoked under any circumstances.
14. Any candidate who has obtained a Third Division at the MCA examination of this University shall be eligible to take the examination again under this Ordinance in the same subject or group of subjects as the case may be for improvement of the division. In such case, the provision of Ordinance No. 138 relating to the improvement of Division shall apply.
15. The provision of Ordinance No. 7-A relating to the condonation of deficiency of marks for passing an examination and Ordinance No. 10 relating to exemption and compartment shall apply to the examination under this Ordinance.
16. An examinee who does not pass or who fails to present himself/herself for the examination shall be eligible for readmission to the same examination, on payment of fresh fees and such other fees as may be prescribed.
17. As soon as possible after the examination, the Management Council shall publish a result of the examinees. The result of final MCA Examination shall be classified as above and meritlist shall

be notified as per Ordinance No.6.

18. Notwithstanding anything to the contrary in this Ordinance, no person shall be admitted to an examination under this Ordinance, if he/she has already passed the same examination or an equivalent examination of any statutory University.
19. i) The examinees who have passed in all the subjects prescribed for all the examinations shall be eligible for award of the Degree of Master in Computer Application.  
ii) An examinee successful at the examination shall on payment of prescribed fees receive a degree in prescribed form signed by the Vice-Chancellor.

\* \* \* \* \*

**SECOND YEAR**  
**SEMESTER : FIRST**  
**OPERATING SYSTEMS**

**3 MCA 1**

- Unit-I : Introduction: Operating System(OS) definition, OS Evolution, OS Components and Services. Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads.
- Unit-II : CPU Scheduling Concepts, Scheduling Criteria and Algorithms. Process Synchronization: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors. Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock.
- Unit-III : Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation. Virtual Memory Management: Background, Demand Paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing.
- Unit-IV : File-System Interface; Directory Structure, File-System Mounting, File Sharing & Protection. File-System Structure, File-System Implementation. Directory Implementation, Allocation Methods, Free-Space Management. File Recovery.
- Unit-V : I/O Systems :Overview, I/O Hardware, Application I/O Interface, and Kernel I/O Subsystem. Transforming I/O to Hardware Operations. Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.
- Unit-VI : The Linux System; History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, Interprocess Communication, Network Structure & Security in Linux.

**Text Book:**

Avi Silberschatz , P.B.Galvin, G. Gagne : “Operating System Concepts” (Sixth Edition) John Wiley & Sons Publication.

**References:**

- i. A.S Tanenbaum “Modern Operating Systems” Pearson Education.
- ii. William Stallings “Operating Systems” Prentice-Hall.
- iii. D M Dhamdhare “Operating Systems” Tata McGraw-Hill.
- iv. M Milankovic “Operating Systems” McGraw-Hill.

**3 MCA 2 FILE STRUCTURES & DATA PROCESSING**

- UNIT I. Introduction : File structure design, File processing operations : open, close, read, write, seek. Unix directory structure. Secondary storage devices: disks, tapes, CD-ROM. Buffer management. I/O in Unix.
- UNIT II. File Structure Concepts : Field & record organization, Using classes to manipulate buffers, Record access, Record structures. File access & file organization. Abstract data models for file access. Metadata. Extensibility, Portability & standardization.
- UNIT III. Data Compression, Reclaiming spaces in files, Introduction to internal sorting and Binary searching. Keysorting. Indexing concepts. Object I/O. Multiple keys indexing., Inverted lists, Selective indexes, Binding.
- UNIT IV. Cosequential processing : Object-Oriented model, its application. Internal sorting : a second look. File Merging : Sorting of large files on disks. Sorting files on tapes. Sort-merge packages. Sorting and Cosequential processing in Unix.
- UNIT V. Multilevel indexing : Indexing using Binary Search trees. OOP based B-trees. B-tree methods Search, Insert and others. Deletion, merging & redistribution. B\*trees. Virtual B-trees. VL records & keys. Indexed sequential file access and Prefix B+trees.
- UNIT VI. Hashing : Introduction, a simple hashing algorithm. Hashing functions and record distributions. Collision resolution. Buckets. Making deletions. Pattern of record access. External hashing. Implementation. Deletion. Performance. Alternative approaches.

**Textbook :**

Michael J.Folk, Bill Zoellick, Greg Riccard : File Structures : An Object-Oriented Approach using C++. (Addison-Wesley) (LPE)

**References :**

1. M.Loomis : Data Management & File Processing (PHI)
2. O.Hanson : Design of Computer Data Files McGraw-Hill (IE).

3. D. E. Knuth :“The Art of Computer Programming” Volume-3. Addison Wesley Pub.

**3 MCA 2 Laboratory :** Programing project as given in the textbook should be implemented for each unit, and a project report (journal) should be submitted. Programming project should span over Chapters 1,2,4,6,7,8,9,10 and 12. This lab should be preferably based on Unix/Linux system.

### 3 MCA 3 JAVA PROGRAMMING

- Unit I: Java Basics: Program Components, Compilation cycle. Introduction to Applet and Application, Data types and Variables, Operators: Arithmetic, relational, Assignment operators. Control statement: Selection statement: if, nested if, switch statement. Repetition statements: while, do-while, for, nested loops.
- Unit II: Introducing classes, class fundamentals, declaring objects, methods, class data, & instance data, constructor, this keyword, access control, Inheritance, Polymorphism, Abstract classes and Interface, Packages. Introduction to String and String Buffer classes, Math class. Arrays: Basics, One - & Multi-dimensional, Array of Objects, Passing array to methods.
- Unit-III: Exception handling: Exception types, uncaught Exceptions, using try and catch, throw, throws, finally clauses, multiple catch clauses, Built-in Exceptions. Multithreaded programming: Java thread model, creating a thread, creating multiple threads, thread priorities & synchronization.
- Unit IV: Java I/O: Stream classes, Byte Stream & Character Streams: Input stream, Output stream, File Input stream, File Output stream, Data Input stream, Data Output stream, PrintWriter, The Applet class and its various methods, Passing parameters to applets. transient & volatile modifiers, using instanceof, using assert.
- Unit-V: Event handling: Event handling mechanisms, Delegation Event model, Event, Event sources & EventListeners, Event Classes, Event Listener Interfaces., Using delegation Event model: Handling mouse events, handling Keyboard events, Adapter classes, Inner classes, anonymous inner classes.

- Unit-VI: Introduction to AWT, AWT classes, Window fundamentals, working with frame windows, Button, TextField, Label. Working with Graphics, Working with colors, AWT controls, Fundamentals: Adding and removing controls, responding to controls. Layout managers.

#### TEXT BOOK:

Herbert Schildt: The Complete Reference Java 2 (5/e) (Tata-McGraw Hill)

#### REFERENCES

- 1) Liang “A Text Book of Java Programming” 2/e (PHI).
- 2) Dietel & Dietel “Java How to Program “ Pearson Education.
- 3) Horstmann & Cornell “Core Java 2 “ Vol-1. Sun Microsystems.
- 4) S. Chavan “Programming in Java” Shroff Pub.

#### LIST OF PROGRAMS

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

#### S. No Name of Program

- |   |   |                              |
|---|---|------------------------------|
| 1 | Write a Java application to print a given format  | * * * *<br>* * *<br>* *<br>* |
| 2 | Design an Applet to Draw a String inside a Pentagon with specified font and color   |                              |
| 3 | Write an Java application for Loan Calculator   |                              |
| 4 | Write an Applet that accepts the user name via Text Field object. When user presses the Enter Key the Applet displays a “Welcome <user name>” with <user name> replaced with actual name entered by user. |                              |
| 5 | Write an Applet that displays a BMI of a person given his or her weight in Kilogram and height in Meters .  |                              |
| 6 | Write an Application program in Java using Switch statement to print A-Z, a-z, 0-9 by inputting ASCII value of first character  |                              |
| 7 | Write an application in Java which reads a string from user as a command line argument and checks the string for vowels, and when the vowel encounters it append the word “egg” before each vowel         |                              |
| 8 | Write an application in Java to design “Simple Calculator”  |                              |

- 9 Write an application in Java which creates an AddressBook class which manages collection of Person object and allows programmer to add, delete, search a Person object in the Address Book
- 10 Write an application in Java which reads and writes User defined Byte Array from and to a file using Low Level File I/O.
- 11 Write an application in Java which creates a File menu on Frame with menuItem “DialogBox”.  
When user clicks on menu Item one Dialog Box will appear on the Frame with one TextField and two Buttons “OK” and “CANCEL”. After entering the data in the TextField and clicking the OK Button Dialog Box closes and data will appear on a Frame Window and when presses CANCEL Button Dialog Box closes and control comes back on Frame Window
- 12 Write an application in Java which return current x,y coordinates when any mouse button is Pressed and draws freehand drawing when mouse is Dragged.

### 3 MCA 4 COMPUTER NETWORKS

- UNIT – I Introduction: Brief history of computer networks & Internet, Layered architecture, Internet protocol stack, Network entities & layers, Application layer: Principles of protocols, HTTP, FTP, SMTP and DNS protocols.
- UNIT – II Transport layer: services & principles, multiplexing & demultiplexing applications, UDP, principles of reliable data transfer, TCP details, principles of congestion control, TCP congestion control.
- UNIT – III Network layer: network service model, routing principles, hierarchical routing, Internet Protocol (IP) & ICMP details, Routing in the Internet, Router internals, IPV6.
- UNIT – IV Link layer: Introduction, services, multiple access protocol, LAN addresses & Address Resolution Protocol, Carrier Sense Multiple Access / CD, Point-to -Point Protocol details.
- UNIT – V Network security issues, principles of cryptography, authentication & authentication protocol, version, integrity: digital signatures, message digests, hash function algorithm, key distribution & certification, secure e- mail.
- UNIT – VI Network Management: Basic principles, infrastructure for network management, The Internet Network –management framework: SMI, MIB, SNMP details, security and administration, ASN 1, Firewalls: Packet filtering and Application gateway.

### TEXT BOOK:

1. James F. Kurose & K W Ross: Computer Networking, Pearson Education (LPE)

### REFERENCES:

1. Douglas E. Comer: Computer Network & Internet, Addison Wesley.
2. Andrew S. Tanenbaum : Computer Networks, PHI (5E)
3. Leon Garcia & Widjaja: Communication Networks, TMH
4. William Stallings: Data & Computer Communication, Pearson Education.

### 3 MCA 5 COMPUTER ORIENTED OPTIMIZATION TECHNIQUES

- Unit I: Introduction, Classification of problems, OR mathematical modeling, Dynamic programming, Investment problem, Equipment replacement, stage coach.
- Unit II: Linear Programming: Introduction, concept of linear programming model, development of LP model, simplex method, Big M method, Duality theory, dual simplex method, Two phase method.
- Unit III: Transportation & Assignment problem: Introduction to transportation problem, mathematical model, types of transportation problem, Optimization techniques for transportation problem , methods to find basic solution, Northwest Corner cell method, Least cost cell method, Vogel Approximation method, optimizing the basic feasible solution using U-V method. Assignment Problem: Introduction, zero-one programming model for Assignment problems, type of assignment problems.
- Unit IV: Introduction to sequencing problem, Two machine, N job three machine sequencing problem, Introduction to Integer Programming, cutting plan Algorithm, branch & bound techniques, zero-one Implicit enumeration algorithm.
- Unit V: Probability OR Model: Basic probability statistical concepts, Introduction to decision theory-minimax decision procedure, Bayes decision procedure with & without data, Regret function versus loss function
- Unit VI: Introduction to Game Theory: minimax, maximum, pure strategies, mixed strategies & expected payoff, solution of 2x4 games, mx2 games, Brown’s Algorithm. Introduction to PERT Network, ET, TE, TL ,SE, critical path, probability of completing events on schedule.

**TEXT BOOKS :**

1. B.E Gilletl , Introduction to Operation Research TMH Edition
2. R.Panneerselvam “Operation Research” PHI.

**References :**

1. J.K. Sharma “Operation Research” (2/e) Macmillan.
2. S.S. Rao Optimization Theory & Application Wiley
- 3 Tata Hamdy, “Operations Research- An Introduction” (5/e), PHI.
4. Taha H. A. “Operation Research” Macmillan.

**3 MCA 6****COMPUTERLAB-III**

This laboratory is based on Operating systems. The laboratory may be based either on Windows or Linux.

Minimum Eight (08) of the following laboratory assignments should be completed and submitted in the form of journal. The external examination shall be based on the programming assignment of any of these modules with via-voce.

- i. Managing multiple processes/tasks.
- ii. Writing Multithreaded Software.
- iii. Manipulating Kernel Objects.
- iv. Thread Synchronization.
- v. Interprocess Communication.
- vi. Memory Management.
- vii. File Systems & Directories
- viii. File Accessing
- ix. Network Programming
- x. I/O Programming & Device Drivers.

**Text-books:**

- i. Gary Nutt: “Operating System Projects Using Windows-NT” (Pearson Education)
- ii. D.P.Bovet & M. Cesati “Understanding the LINUX Kernel” (3/e) O’Reilly, Shroff Publishers.

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**SECOND YEAR****SEMESTER : SECOND****4 MCA 1****DATABASE MANAGEMENT SYSTEMS**

- Unit-I: Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Database Languages, Database Users and Administrators, Transaction Management, Database System Structure, Application architectures, 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 an E-R Schema to Tables.
- Unit-II: Relational Model: Structure of Relational Databases, The Relational Algebra, Extended Relational-Algebra Operations, Modification of the Database, Views, The Tuple Relational Calculus, The Domain Relational Calculus, SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Views.
- Unit-III: Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL, Encryption and Authentication, Relational-Database Design:, First Normal Form, Pitfalls in Relational-Database, Design, Functional Dependencies, Decomposition, BCNF, Third, Fourth and more Normal Forms, Overall Database Design Process.
- Unit-IV: Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Query Optimization: Overview, Estimating Statistics of Expression Results, Transformation of Relational Expressions, Choice of Evaluation Plans, Materialized Views.
- Unit-V: TRANSACTIONMANAGEMENT: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability, Implementation of Isolation, Transaction Definition in SQL, Testing for Serializability.
- Unit-VI: Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularities, Multiversion Schemes, Deadlock Handling, Insert and Delete Operations Weak Levels of Consistency, Concurrency in Index Structures. Recovery System, issues & solutions.

**TEXT BOOK:**

Korth, Sudarshan : Database System Concepts , McGraw Hill, 4<sup>th</sup> Edition

**REFERENCES:**

1. Raghu Ramkrishnan :Database System (TMH)
2. C.J.Date : Database System, 7<sup>th</sup> ed.,(Pearson Education)
3. Connolly & Begg, : Database System, Low Price Ed. (Pearson Education)
4. Navathe & Elmars, Fundamentals of Database Systems. 4/e (Pearson Education).

**4 MCA 1 Database Management Systems Laboratory**

The sample list of programs based on ORACLE or MY SQL is given below. Aim of the list is to inform about minimum expected outcomes.

1. Consider the employee database, where the primary keys are underlined & Write the Queries using following clauses & also retrieve the data from the given database.  
Employee (employee-name,street,city)  
Works (employee-name,company-name,salary)  
Company (company-name,city)  
Manages(employee-name,manager-name)  
I) Order By II) Between III) Group By IV) Having
2. Consider the above database & perform the different Join Operations which are as follows.  
I) Inner Join II) Left Outer Join III) Right Outer Join IV) Full Outer Join
3. Consider the above database & Perform the different Set Operations Which are as follows.  
I) Union II) Intersect III) Except/Minus
4. Consider the above database & perform the all Aggregate Functions.
5. Write an assertion for the bank database to ensure that the assets value for the 'perryridge' branch is equal to the sum of all amounts lent by the 'perryridge' branch.  
Customer(customer-name, customer-street, customer-city)  
Branch(branch-name, branch-city, asstes)  
Loan(loan-number,branch-name,amount)  
Borrower(customer-name,loan-number)  
Depositor(customer-name, account-number)  
Account(account-number,branch-name,balance)
6. Write an SQL trigger to carry out the following action: On delete of an account, for each owner of the account, check if the owner has

any remaining accounts, and if she does not, delete her from the depositor relation.

7. Consider the above Bank database & write the SQL queries for the following views:  
i) A view containing the account numbers the customer names for all accounts at the deer park branch. ii) A view containing the names and addresses of all customers who have an account with the bank, but do not have a loan.
8. Mini Project Using Oracle 9i & VB6 / VB.Net.

**4 MCA 2****CLIENT SERVER COMPUTING**

- UNIT-I Networking in Java: Basics, Socket Overview, Client/Server concepts, Proxy servers, Internet addressing, Java Networking classes & interfaces, InetAddress, TCP/IP Client sockets, URLConnection, TCP/IP Server sockets. Creating TCP client/server.
- UNIT-II Java Database Connectivity, JDBC Concepts, JDBC API, DriverManager, Connection, Statement and ResultSet classes with relevant methods. Prepared & callable statements, Handling queries, inserts, deletes and updates to database. Displaying the query results.
- UNIT III Introduction to XML; Writing XML, Well-formed XML documents, creating a DTD, Elements, Attributes & Entities definitions. Validation of documents, XML schema. Defining simple & complex types. Namespaces, schemas and validation. DOM & SAX programming models, Cascading Style Sheets (CSS) & XML.
- UNIT IV Servlets in Java; Servlet structure & lifecycle. Servlet API basics, Various classes & interfaces. Servlet requirements, writing. Running and debugging of Servlets, Concepts of Cookies, Servlets & cookies. State and session management with Servlet API. Server side includes and request forwarding. Servlet chaining. Jdbc Servlets.
- UNIT V Remote Method Invocation (RMI): Object serialization in Java, Concept of remote object, Architecture of RMI application, Java RMI package, classes & Interfaces, Client/Server application using RMI, RMI Servlets, RMI-JDBC Servlets.
- UNIT VI Introduction to JSP; Simple JSP concepts, Request-time expressions. Advanced JSPs: Scripts. conditionals, loops, Try/Catch. Concept of Beans, Properties, Bean instances &



serialization; Bean Scopes, Writing Beans, Introspection, Beans & Scriptlets..

**Books:**

1. Dustin R Callaway: Inside Servlets Pearson Education (LPE)
2. XML Related Technologies and Programming in Java by IBM EEE (PHI).
3. Larne Pekowasky: Java Server Pages, Pearson Education (LPE)
4. Dietel & Dietel: WWW: How To Program, Pearson Education (LPE)
5. Dietel, Nieto, Lin, Sadhu : XML: How to Program, Pearson Education.
6. Horstmann & Cornell “Core Java 2” Vol-1 & Vol. II., Sun Microsystems.

**4 MCA 2 CLIENT SERVER PROGRAMMING LAB**

**LIST OF PROGRAMS**

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

- 1 Write programs to study concept of client-Server system, working of Client, working of Server and kinds of Client- Server using Java Sockets.
2. Write programs to study concept of JDBC, connect to database, insert a row into a table through JDBC, query the table(s), and display the result of query through JDBC.
3. a) Introduction to Servlet that describe the Servlet Life cycle with various Http methods, Advantages of Servlet user CGI.  
b) Write a simple Servlet oriented program to print “Hello World” on a client machine. Repeat this with RMI-servlet.
4. Write a program to create cookies that accepts Personal information in a Form from the user and whenever the user clicks “Submit” button cookie will be sent and when the user retrieves cookie from his site the values sent in the cookie should be display on the HTML page
5. (a) Write a program to design and implement customer Registration system which allows you (Customers) to register them with your site. The data is captured by Servlet and stored in the database using JDBC . (b) Repeat this exercise with RMI.
6. (a)Write a program using Session that selects the programming language and when Submit button is clicked a page with Session information gets displayed along with the information for selecting

another language and other to get recommended books which displays the requested page when clicked.

(b) Repeat this exercise with RMI.

7. Write programs to create a DTD for Library System, DTD for e-commerce application.
8. Write a program to create a Bean that will create a Rectangle with color property in it and set its various properties like Height, width etc.
9. Write a program to implement the program for Quiz using JSP.
10. Implement one mini Project using Servlets, Cookies, JDBC, JSP.

**4 MCA 3 MULTIMEDIA TECHNOLOGIES**

- UNIT I. Multimedia Authoring and Data Representations: Introduction. Components of Multimedia. Hypermedia and Multimedia. Overview of Multimedia Software Tools, Multimedia Authoring, VRM. Graphics and Image Data Representations: 1- Bit Images, 8-Bit Gray-Level Images, 24-Bit Color Images, 8-Bit Color Images, Color Lookup Tables, Popular Image File Formats.
- UNIT II. Color in Image and Video Color Science, Color Models in Images, Color Models in Video. Fundamental Concepts in Video: Types of Video Signals, Component Video, Composite Video, S-Video, Analog Video, NTSC Video, PAL Video, SECAM Video, Digital Video.
- UNIT III. Basics of Digital Audio: Digitization of Sound, Digitization, Nyquist Theorem, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR), MIDI: Musical Instrument Digital Interface. Hardware Aspects of MIDI, Structure of MIDI Messages, General MIDI, MIDI-to-WAV Conversion.
- UNIT IV. Multimedia Data Compression: Lossless Compression Algorithms: Basics of Information Theory, Run-Length Coding, Variable-Length Coding, Dictionary-Based Coding, Arithmetic Coding, Lossy Compression Algorithms: Introduction, Distortion Measures, Quantization, Uniform Scalar Quantization, No uniform Scalar Quantization, Image Compression Standard: The JPEG Standard.
- UNIT V. Basic Video Compression Techniques: Introduction, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261 Encoder and Decoder, MPEG-1, Motion Compression in MPEG-1, MPEG-2, Supporting

Interlaced Video, MPEG-2 Scalabilities, Other Major Differences from MPEG-1.

UNIT VI. Basic Audio Compression Techniques: ADPCM in Speech Coding, Vocoders, Phase Insensitivity, Channel Vocoder, Format Vocoder, Linear Predictive Coding. Audio Compression: Psychoacoustics, Equal-Loudness Relations, Frequency Masking, Temporal Masking, MPEG Audio, MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithm.

**Text Book:**

Ze-Nian, Li, Mark S. Drew “Fundamentals of Multimedia” (Pearson Education)

**References:**

1. Rajan Parekh “Principles of Multimedia “ (Tata McGraw-Hill)
2. S.J. Gobbs & D.C. Tschritzis “Multimedia Programming”. Addison Wesley 1995
3. P.W. Agnew & A.S. Kellerman “Distributed Multimedia”. , Addison Wesley 1996
4. F. Fluckiger,” Understanding Networked Multimedia”. Prentice-Hall 1995

**4 MCA 3 Laboratory:**

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

**4 MCA 4**

**ELECTRONIC COMMERCE**

UNIT-I

History of e-commerce, Advantages & disadvantages of e-commerce, Indian business context, IT Act 2000, E-business models: based on the relationship of transaction Parties & Transaction Types. Examples of various e-business models in practice.

UNIT-II Enabling technologies of the WWW, Internet client/server applications, Networks & Internet, Software agents, ISPs, E-Marketing: Identifying Web Presence Goals, Browsing Behavior Model, Online marketing, E-advertising, E-branding, Marketing strategies.

UNIT-III E-security: security on the Internet, E-business risk management issues,. E-Payment systems: digital payment requirements, digital-token-based e-payment

systems,classification of new payment systems,properties of E-cash, Cheque paymentsystem, risk & e-payment system, Designing of e-payment system, digital signature.

UNIT-IV E-customer relationship management, E-CRM solutions, E-CRM toolkit, Typical business touchpoints, CRM & workflow automation. E-Supply chain management: supply chain, E-logistics, examples of smart chains, ways to reduce inventory, E-SCM advantage & benefits, E-Supply chain components, architecture and trends in E-SCM.

UNIT-V E-Strategy: Information & Strategy, Virtual value chain, seven dimensions of e-commerce strategy, Value chain & E-strategy, Planning the e-commerce project, E-commerce strategy & knowledge management. E-business strategies,data warehousing and data mining.

UNIT-VI Mobile commerce: Growth & success, wireless applications. Technologies for mobile commerce, origin of WAP, WAP programming model, Wireless technologies, Different generations in wireless technologies, security issues to cellular technologies, M-Commerce in India.

**Text Book:**

P.T .Joseph, S.J. “E-Commerce: An Indian Perspective” (2/e) (PHI)

**Reference Books**

1. Trepper C. “E-commerce Strategies” Prentice-Hall.
2. Thakkar M. “E-commerce Applications using Oracle8 & Java” Prentice-Hall.
3. Bill Brogden & Chris Minnick “Java Developers’ Guide to E-Commerce with XML & JSP” (BPB).
4. D. Minoli & E. Minoli: Web Commerce Technology Hand Book (TMH).

**4 MCA 4 Laboratory:** The lab shall be based on the following programming-cum-development assignments:

- i. A catalog in XML. ii. Presenting the catalog online. iii. Filling a shopping cart.
- iv. Billing & Order confirmation. v. Online catalog upkeep.
- vi. Using surveys to know the customers. vii. News on the e-commerce sites.

**Text-book for 4MCA 4 labs is:**

Bill Brogden & Chris Minnick “Java Developers’ Guide to E-Commerce with XML & JSP” (BPB).

**4 MCA 5****ELECTIVE-I  
(1) COMPUTER GRAPHICS**

- Unit I: An overview of Computer Graphics and Graphics System : Video display devices, Raster-Scan systems, Random-Scan systems, Graphics monitors and workstations, input devices, hard copy devices, Graphics software..
- Unit II : Output primitives : Point and Lines, Line drawing algorithms, loading the frame buffer, line function, circle and ellipse generating algorithms, curves, parallel curves algorithms, Pixel addressing, filled-area primitives , functions, Cell array, character generation.
- Unit III: Attributes of output primitives : Line and curve attributes, color and grayscale levels, area fill attributes. Character attributes, bundled attributes, antialiasing.
- Unit IV: 2-D geometric transformations : basic transformations, matrix representations, composite transformations, other transformations, transformations between coordinate systems, affine transformations, transformation functions, Raster methods for transformations. Two-Dimensional viewing : viewing coordinates, Window-to-viewport coordinate transformation, viewing functions, clipping : point, line, polygon, curve, text, exterior.
- Unit V : Structures and hierarchical modeling : concepts, editing structures, basic modeling concepts, hierarchical modeling, GUI and interactive input methods : the user dialogue, input of graphical data, functions, initial values for input device parameters, interactive picture - construction techniques, virtual reality environments.
- Unit VI: Three dimensional concepts : display methods, graphics, Bezier curves and surfaces, B-spline curves and surfaces, Beta-splines, three dimensional geometric and modeling transformations : translation, rotation, scaling, three dimensional viewing : viewing pipeline, viewing coordinates, projections.

**TEXT BOOK :**

D. Hearn, M.P.Baker : Computer Graphics, II edition (Pearson Education)

**REFERENCES:**

- 1) F.S.Hill : Computer Graphics Using Open GL, II edition (Pearson Education)
- 2) W.M.Newman & R.F.Sproul : Principles of Interactive Computer Graphics, 2/e, (McGraw Hill)

3) F.S.Hill : Computer Graphics (Macmillan)

4) Harington : Computer Graphics (McGraw Hill)

**4 MCA 5****ELECTIVE-I  
(2) MODELING & SIMULATION**

- UNIT – I System Models and System studies: Basic concepts of systems and system modeling static and dynamic/physical and mathematical models-principles used in modeling-corporate models- analysis, design and postulation of system.
- UNIT – II Basic Concepts and continuous system : Techniques used-distributed log models and cobweb models continuous system Model- Analytical equations and methods of obtaining solutions –analog and hybrid computers and simulations CSSLS examples of different continuous system
- UNIT – III System dynamics, probability concepts and basic principles of discrete simulation Growth and decay models system dynamics diagrams examples-stochastic Process-probability functions and their evaluation-random number generation–rejection method-comparison of Monte-Carlo method and stochastic simulation-examples.
- UNIT – IV Simulation of Queuing System and PERT Network  
Simulation of Queuing system: Rudiments of queuing theory, simulation of a single server queue, simulation of a two server queue, simulation of more general queues. Simulation of a PERT Network: Network model of a project, Analysis of an activity network, critical path
- UNIT – V Simulation of Inventory Control & Forecasting Design and Evaluation of Simulation Experiments Inventory Control and Forecasting: Elements of inventory theory, more Complex inventory models, simulation example=1, Generation of Poisson and Erlanger variates, Simulation example- 2, Forecasting and regression Analysis. Design and Evaluation of simulation Experiments: Length of Simulation runs, variance reduction techniques, Experimental layout, Validation, summary and conclusion.
- UNIT – VI Simulation of Languages and Introduction to GPSS  
Different special purpose languages used for continuous and discrete systems and comparison –factors affecting the selection of discrete system simulation languages-

comparison of GPSS and SIMSCRIPT. A detailed study of GPSS with examples.

**TEXT BOOKS:**

1. Geoffrey Gordon “System Simulation”, II Edition, PHI Pvt.Ltd., New Delhi- 1987.
2. Narsingh Deo, “System Simulation with Digital Computers” PHI Pvt.Ltd.,New Delhi.

**REFERENCES:**

1. Shannon R.E.,”System Simulation: The Art of Science” Prentice Hall,Englewood Cliffs,NY,1975.
2. Hugh j. Watson, John H. Blackstone ,Jr., “Computer Simulation” 2nd Edition, John Wiley & Sons.
3. James A. Payne “Introduction to Simulation: Programming Techniques and Methods of Analysis” McGraw Hill.

**4 MCA 6 Seminar**

The seminar should be based on the recent trends in computing and the applications. Each student should carry out the literature survey through Internet to identify the current trends in computer applications. The survey should culminate into an application that truly reflects the use of computing in that domain. The seminar report should be prepared based on the technical aspects of the application rather than the description of application.

The candidate shall deliver the seminar for minimum fifteen minutes followed by the question answer session. The marks distribution for the seminar shall be as follows:

<b>Seminar Report</b>		<b>Seminar Presentation</b>				
Contents	Format	Topic	English Coverage	Presentation Style	Question Answer Session	Attendance in all the seminar sessions
05	05	05	05	05	15	10

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**THIRD YEAR  
SEMESTER : FIRST**

**ARTIFICIAL INTELLIGENCE**

**5MCA1**

**UNIT I.**

Introduction to Artificial Intelligence: Overview of Artificial Intelligence. Knowledge : General concept, Introduction to LISP : Syntax and numerical functions. Basic list manipulation function in LISP. Functions, predicates and conditional Input, output and local variables, iteration and recursion. Property list and arrays.

**UNIT II.**

Knowledge representation - I: Syntax and semantics for propositional logic. Syntax and semantics for FOPL. Properties of Wffs. Conversion to clausal form. Inference rules. The resolution principle, Nondeductive inference methods. Representation using rules.

**UNIT III.**

Knowledge representation - II: Truth maintenance system. Default reasoning and closed world assumption. Predicate completion and circumscription, model and temporal logics. Overview of object oriented systems, object classes messages and methods, simulation examples using OOS program.

**UNIT IV.**

Knowledge organization and manipulation: Preliminary concept, Examples of search problems, Uniformed and blind search. Informed search. Searching AND-OR graphs, structure used in matching. Measures for matching: distance matrices, qualitative measures, similarity measures. Partial matching, Indexing and retrieval technique, Integrating knowledge in memory. Memory organization system.

**UNIT V.**

Knowledge Acquisition : General concept in knowledge acquisition, Learning by induction. Analogical and explanation based learning : Analogical learning and reasoning, Explanation and learning.

**UNIT VI.**

Expert system : Expert system architectures : Introduction, Rules based system architecture. Nonproductive system architecture, Dealing with uncertainty. Knowledge acquisition and validation. Knowledge system building tools.

**Text Book:**

1. Patterson D.W.; “Artificial Intelligence and Expert Systems”, PHI

**Reference Books :**

1. P.H. Winston, “Artificial Intelligence,” Addison- Wesley Publication Company II Edition, 1984.

2. F.Holtz, "LISP-The language of Artificial Intelligence," TAB Books Inc. Blue Rodge Summit. PA17214, 1985.
3. Peter Jackson, "Introduction to expert systems," Addison-Wesley Publishing Company, 1986.
4. D.W.Rolston, "Principles of Artificial Intelligence and Expert Systems Development," McGraw Hill International Edition, 1988.
5. E.Rich, K.K.Knight, "Artificial Intelligence," Tata McGraw Hill, New Delhi, 1991.

### Artificial Intelligence Lab.

At least Twelve experiments must be performed which will include at least one experiment on each Unit. Use of LISP/PROLOG is suggested.

### 5MCA2 SOFTWARE PROJECT MANAGEMENT

- UNIT I. Evolving role of Software. Software crises & myths. Software Engineering. Software process & process models : Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts : People, Product, Process, Project. WSHH principle, critical practice.
- UNIT II. Measures, Metrics & Indicators. Metrics in process & project domains-software measurment, Metrics for software quality, small organization. Software projects Planning : Scope, resources, estimation, decomposition technique, Tools. Software risks : identification, risk projection, refinement & RMMM plan.
- UNIT III. Project Scheduling : Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.
- UNIT IV. System engineering : Hierarchy, Business Process & Product engineering : Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation.
- UNIT V. Software architecture, Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis & modeling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation.

- UNIT VI. Software testing fundamentals ; test case design, Whitebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.

#### Textbook :

Pressman Roger. S. : Software Engineering, A Practitioner's Approach TMH.

#### References :

1. Somerville : Software Engineering (Addison-Wesley) (5/e)
2. Fairly R. : Software Engineering (McGraw Hill)
3. Davis A. : Principles of Software Development (McGraw Hill)
4. Shooman, M.L. : Software Engineering (McGraw-Hill)

### 5MCA2 SPM Laboratory ; Based on above syllabus, at least one

software development project involving all phases of SDLC.

The case studies from the textbook and from reference book 3 may be considered as examples.

### 5MCA3 SYSTEM ADMINISTRATION AND SECURITY

- UNIT I. Introduction to network security, passive and active attacks, authentication, integrity, access control, The model of internetwork security, internet standards : the internet society and RFC publications (Request for comments.)
- UNIT II. Cryptography : Encryption principles and various algorithms, standardization process, key distribution, public key cryptography and message authentication, digital signature.
- UNIT III. Network security applications : Kerberos, X.509 directory authentication services, e-mail security PGP (Pretty Good Privacy) operational description. MIME (Multipurpose Internet Mail Extensions), S MIME (Security/Multipurpose internet mail extensions) functionality.
- UNIT IV. IP Security : Overview, IP security architecture, Authentication header, Web Security : Web security requirements, secure socket layer SSL, Transport layer security TLS, Secure electronic transactions TES.
- UNIT V. Network Management Security : Basic concepts of SNMP, Network management architecture and protocol architectures, proxies, services, SNMPv1 authentication service, access policy and proxy service, SNMPv2 architecture, message processing and user security model, view based access control.

- UNIT VI. System Security : Intruders, Intrusion technologies, password protection, password selection strategies, Intrusion detection, viruses and related threats : Nature of viruses, types, micro viruses and various antivirus approaches. Firewall : Characteristics, types of fire walls, Firewall configuration, Trusted systems, data access control, the concept of the trusted systems.

**PRACTICALS** : Minimum 8 experiments based on above syllabus.

**Text Book :**

Network Security Essentials - William Stallings (Pearson Edu. Asia)

**Reference Books :**

1. Security for Telecommunication and Network management by Moshe Rozenbit (PHI)
2. Internet Security Protocols - Protecting IP Traffic, by Uyless Black (Pearson Edu. Asia)

**5MCA4 MANAGEMENT INFORMATION SYSTEMS**

- UNIT-I MIS concepts, definition, Role, Impact of MIS, MIS and computers, MIS and academics, MIS support to Management, Role and importance of management. MIS and process of management MIS in orgn structure and strategic management business.
- UNIT-II Basics of MIS : Decision making, Decision methods, behavioral concepts, organizational decision making, MIS and decision making concepts, Information; concepts and classification, Methods of data and information collection: value of information, organization and information. Human as an information processor. Development of MIS and choice of IT.
- UNIT-III Applications of MIS : Applications in manufacturing sector, applications in service sector, Introduction to service, sector, Creating a destructive services, MIS applications in service industries and role of MIS in source industries. DSS: Concepts and philosophy, deterministic systems and knowledge based expert systems. MIS and role of DSS. MIS in Enterprise Management System.
- UNIT-IV Technology in MIS : Data processing, Transaction processing, Application processing, Information System processing, TQM of IS. DBMS: Object Oriented Technologies, client Server Arch. And MIS.

- UNIT-V MIS and Networks : Network Topology, LAN, Data Communication, ATM Technology, Business Process Reengineering: Introduction BP, Process Model of organization, Value stream model, Delays in BP, Relevance of IT, MIS and BPR.

- UNIT-VI MIS and Datawarehouse : Architecture, Design and Justification of datawarehouse, organization. Management and implementation of data -warehousing, E-Business: Models, WWW, E-payment, security in E-business, MIS and E-business.

**Text Book :**

W. S. Jawadekar : Management Information System (II Edition), (TMH)

**Reference Book :**

Kenneth C. Landon & J. P. Landon.: Management Information System, 8th Ed. Pearson Education.

**5MCA5 ELECTIVE-II**

**(I) DATA WAREHOUSING AND DATA MINING**

- UNIT I: Introduction, Data mining, Data mining functions, classification and major issues. Data Preprocessing: Data cleaning, data integration and transformation, data reduction, discretisation & concept hierarchy generation.
- UNIT II: Data mining primitives: Data mining primitives, data mining query language. Concept description: concept description, data generalization, Analytical characterization, mining class comparison.
- UNIT III: Application and trends in data mining : data mining applications, data mining systems and research prototypes, additional themes on data mining, trends in data mining .
- UNIT IV: Data ware house and OLAP Technology for data mining: What is data ware house, multidimensional data model, data ware house architecture, data ware house implementation.
- UNIT V: Data Staging: overview, plan effectively, dimension table staging, fact table loads and ware house operations, data quality and cleansing, miscellaneous issues.
- UNIT VI: Building end user applications : role of end user application, application specification, end user application development, maintaining and growing data ware house : manage the existing data ware house environment, prepare for growth and evaluation.

**Text Books :**

1. J. Han and M.Kamber: Data Mining Concepts and Techniques, Elsevier Pub. Indian Reprint, 2004.
2. R. Kimball: The Data Ware House Life Cycle Tool Kit, Wiley Press, John Wiley and Sons ASIA) Pvt. Ltd.

**Reference Books :**

1. Berson : Data Ware Housing, Data Mining and OLAP, Tata McGraw Hill.
2. Arun K. Pujari : Data Mining Techniques, University Press (Orient Longman)

**5MCA5**

**ELECTIVE-II  
(2) BIOINFORMATICS**

- UNIT I: Introduction to Bioinformatics: Branches, Aim, Scope/ Research Areas, Sequence File Formats, Sequence Conversion Tools, Molecular File Formats, Molecular File Formats Conversion.
- UNIT II: Biological databases, Classification Schema of Biological Databases, Biological Database Retrieval Systems, Tools and Databases of NCBI, Database Retrieval Tool, Nucleotide Database, Literature Database, Protein Database, Chemical Database, EMBL Nucleotide Sequence Database, Curation , Sequence Analysis Tools, DNA Data Bank of Japan.
- UNIT III : Protein Information Resource (PIR) , resources, Data retrieval, Databases, Protein 3D Structure and Classification Databases : Introduction , Data Deposition Tools, Molecular Modeling Database (MMDB), Retrieval of Structural Data from MMDB, Conserved Domain Database (CCD), E-MSD, 3D- genomics, Gene3D, Protein Structural Classification Databases, CATH, SCOP.
- UNIT IV : Sequence Alignments, Concepts, Scoring Matrices, PAM, BLOSUM, Alignment of Pairs of Sequences, Alignment Algorithms, Heuristic Methods, Multiple Sequence Alignment (MSA). Gene Prediction Methods, Overview, Computational methods, methods
- UNIT V : Protein Structure and Modeling : Introduction , Levels of Protein Structure, Conformation Parameters of Secondary Structure of a Protein, Secondary structure Types, Secondary Structure Prediction, Software of Secondary Structure Prediction, Limitations, Protein Modeling, Homology or Comparative Modelling, Model refinement, Evaluation of the

Model, hands on in Comparative Modeling using Swiss-model, Threading or Fold Recognition.

- UNIT VI: Bioinformatics in Computer-aided Drug Design : Drug Discovery Process , Structural Bioinformatics in Drug Discovery, SAR and QSAR Techniques in Drug Design, Graph Theory, Molecular Docking, Recent Upcoming, Modeling Dynamics and Simulations, Monte Carlo methods, Molecular Dynamics, Energy Minimization, Leading MD Simulation Packages.

**Text Books:**

- 1 . Zhumur Ghosh, Bibekanand Mallick ; Bioinformatics – Principles and Applications – Oxford Higher Education Pub

**Reference Books:**

1. Hooman H. Rashidi and Lukas K.Buehler: Applications in Biological Science and Medicine , CAC Press 2000
2. David Mount; Bioinformatics. 2000. CSH Publications
3. Stephen Misener, Stephen A. Krawetz; Bioinformatics- Methods and Protocols-Human Press
4. Harshawardhan P.Bal; Bioinformatics – Principles and Applications, TATA MCGRAW-HILL.

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**THIRD YEAR**

**SEMESTER : SECOND**

**6 MCA 1 PROJECT & DISSERTATION FULL TIME**

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Three Year Post Graduate Course  
Master in Computer Applications (MCA)  
SEMESTER PATTERN

**SECOND YEAR SEMESTER-I**

Sr.	Sub. No.	Subject Code	Teaching Scheme					Examination Scheme						
			L	P	Total periods/ week	Duration of Papers (Hrs)	THEORY Max. Marks Theory Papers	Max. Marks College Assessment.	To- tal	Min. pass marks	Max. Marks	Max. Marks College Assessment	To- tal	Min. Pass Marks
1.	3 MCA 1	Operating Systems	4	-	4	3	80	20	100	40	--	--	--	--
2.	3 MCA 2	File Structures & Data Processing	4	2	6	3	80	20	100	40	25	25	50	25
3.	3 MCA 3	Java Programming	4	2	6	3	80	20	100	40	25	25	50	25
4.	3 MCA 4	Computer Networks	4	-	4	3	80	20	100	40	--	--	--	--
5.	3 MCA 5	Computer Oriented Optimization Techniques	4	2	6	3	80	20	100	40	25	25	50	25
6.	3 MCA 6	Computer Lab.-III	-	4	4	-	--	--	---	--	50	50	100	50
<b>TOTAL</b>			20	10	30				500				250	

**GRAND TOTAL : 750**

**SECOND YEAR SEMESTER-II**

1.	4 MCA 1	Database Management Systems	4	2	6	3	80	20	100	40	25	25	50	25
2.	4 MCA 2	Client Server Computing	4	2	6	3	80	20	100	40	25	25	50	25
3.	4 MCA 3	Multimedia Technologies	4	2	6	3	80	20	100	40	25	25	50	25
4.	4 MCA 4	Electronic Commerce	4	2	6	3	80	20	100	40	25	25	50	25
5.	4 MCA 5	Elective-I *	4	-	4	3	80	20	100	40	--	--	--	--
6.	4 MCA 6	Seminar **	2	-	2	-	--	--	---	--	--	50	50	25
<b>TOTAL</b>			22	8	30				500				250	

**GRAND TOTAL : 750**

Elective - I \*      1) Computer Graphics                      2) Modelling & Simulation  
Seminar \*\*        : Seminar should be on recent trends in Computing & applications.



Three Year Post Graduate Course  
Master in Computer Applications (MCA)  
SEMESTER PATTERN  
**THIRD YEAR SEMESTER-I**

Sr.	Sub. No. No.	Subject Code	L	Teaching Scheme				Examination Scheme						
				P	Total	periods/ week	Dura- tion of Papers Hrs)	THEORY		To- tal	Min. pass marks	PRACTICAL		
							Max. Marks Theory Papers	Max. Marks College Assess- ment.				Max. Mar- ks	Max. Marks College Assess- ment	To- tal
1.	5 MCA 1	Artificial Intelligence	4	2	6	3	80	20	100	40	25	25	50	25
2.	5 MCA 2	Software Project Management	4	2	6	3	80	20	100	40	25	25	50	25
3.	5 MCA 3	System Administration & Security	4	2	6	3	80	20	100	40	25	25	50	25
4.	5 MCA 4	Management Information System	4	-	4	3	80	20	100	40	--	--	--	--
5.	5 MCA 5	Elective-II *	4	-	4	3	80	20	100	40	--	--	--	--
6.	5 MCA 6	Mini Project	-	4	4	-	--	--	---	--	50	50	100	50
TOTAL			20	10	30				500				250	

**GRAND TOTAL : 750**

Elective-II \* (i) Data Warehousing & Data Mining (ii) Bioinformatics

**THIRD YEAR SEMESTER-II**

1.	6 MCA 1	Project & Dissertation	Full Time		-	--	--	---	--	150	100	250	150
TOTAL												250	

**GRAND TOTAL : 250**

**SANT GADGE BABAAMRAVATI UNIVERSITY.**  
**SPECIAL NOTE FOR INFORMATION OF THE STUDENTS**

- (1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.
- (2) Be it known to all the students desirous to take examinations for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinances Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevant extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Improvement of Division (Higher Class) and getting Distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute, No.18, Ordinance, 2001.
Ordinance No. 9	:	Conduct of Examinations (relevant extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6/2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

**Prof. J.S.Deshpande**  
Registrar  
Sant Gadge Baba  
Amravati University.

**PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM**

The pattern of question paper as per unit system will be broadly based on the following pattern.

- (1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.
- (2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.
- (3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.
- (4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.
- (5) Each short answer type question shall contain 4 to 8 short sub question with no internal choice.