MANGALORE UNIVERSITY

Draft revised Regulation governing Master of Computer Applications (MCA) Programme

(Framed under Sec. 44(1) (c) of the KSU Act, 2000)

1. **Title of the course:**

   The course shall be called Master of Computer Applications (M.C.A.) degree programme.

2. **REPEAL AND SAVINGS:**

   The existing regulations governing Master of Computer Application programme shall stand repealed. However, it shall continue to be in force for the students who have been admitted to the course before the enforcement of this regulation.

3. **ELIGIBILITY FOR ADMISSION:**

   Candidates shall have passed the Bachelor Degree examinations with not less than 50% marks in aggregate of all the years of the Degree examination. However, in the case of candidates belonging to SC/ST/Category-I, the aggregate percentage of marks of all the years of the qualifying examination shall not be less than 45%.

   Provided that the candidates shall have passed Bachelor Degree with not less than 50% marks with Mathematics/Statistics/Computer Science/Computer Applications/Computer Programming/ Business Mathematics / Business Statistics as one of the optional/elective subject. However, in the case of candidates belonging to SC/ST/Category-I, the percentage of marks shall not be less than 45%.

   Provided further that in respect of candidates who have studied and passed one of the subjects specified in the first proviso in the Pre-University Course with 50% marks in that subject shall also be considered for admission. However, in the case of candidates belonging to SC/ST/Category-I, 45% marks in that subject shall be considered for admission.

   The selection and the eligibility criteria determined by the Government of Karnataka from time to time shall be followed for state level selection.

4. SCHEME AND DURATION OF THE COURSE:

The course of study shall be for a period of 3 years spread over 6 semesters, each of the first five semesters shall be of 4 months duration and the sixth semester shall be of 6 months duration as the students are required to undertake project works at Software Industry/ R&D organisation/University. There shall be University examination at the end of each semester. The course pattern and the scheme of examination are as follows.

Semesters	Papers	No of hours per week/Theory/ Practical	Duration of exam in hrs per Theory/ Practical	Marks		Each Subject	Each Semester
				I.A	Exam		
I / II /III	5 Theory Papers	4	3	25	75	100	500
	2 Practicals	4	3	25	50	75	150
						Total	650
IV / V	5 Theory Papers*	4	3	25	75	100	500
	2 Practical	4	3	25	50	75	150
	Project / Seminar	1	-	50	-	-	50
						Total	700

* include elective subjects

SEMESTER	FINAL SEMESTER PROJECT WORK		
	Project Dissertation valuation (Average of both Internal & External Guide)	VIVA-VOCE EXAM.	TOTAL MARKS
VI	300	100	**400**

Grand Total Marks of all the SIX Semesters: 3750

5. MAXIMUM PERIOD FOR THE COMPLETION OF THE COURSE:

Maximum period for completing the six semester M.C.A. course shall be six years from the date of admission.

6. MEDIUM OF INSTRUCTION:

The medium of instruction shall be English/Kannada.

7. ATTENDANCE:

The candidate shall be considered to have undergone a prescribed course of study if he/she attended a minimum of 75% of the total instruction hours in a paper (theory/practical) including tutorials and seminars in each semester. Each paper (theory/practical) shall be treated as an independent unit for the purpose of attendance.

There shall be no provision for Condonation of shortage of attendance and a student who fails to secure 75% attendance in a paper shall be required to repeat that semester.

8. INTERNAL ASSESSMENT

Marks for internal assessment shall be awarded on the basis of seminars, field work, assignments or performance of two class tests of one hour duration each. The internal assessment marks shall be notified on the department / college notice board for the information of the students and it shall be communicated to the Registrar (Evaluation) within 10 days before the commencement of the University examinations, and the Registrar (Evaluation) shall have access to the records of such internal assessment evaluations.

9. REGISTERING FOR THE EXAMINATIONS:

A candidate shall register for all the papers of a semester when he/she appears for the examination of that semester for the first time.

10. BOARD OF EXAMINERS:

Board of examiners constituted by the University shall consist of a Chairman, internal and external members out of which at least one shall be from the Department/College offering the course and at least two external members from other universities. The board shall scrutinize the question papers and shall forward for the approval of university.

11. PAPER SETTING AND VALUATION OF ANSWERSCRIPTS:

i) Theory Examination

The question papers shall be jointly set by external and internal examiners. The internal examiner shall normally be the person who has taught the course and the external examiner shall be in the panel and duly approved by the University. The Chairman of B.O.E. should get the necessary approval of the University in respect of examiners.

The answer script shall be independently valued by both the examiners who had set the question papers. Both internal and external examiners shall send the marks lists to the Registrar (Evaluation).

The marks awarded to the candidates will be the average of the two marks awarded by the examiners provided that if the difference between the marks awarded is less than 20% of the maximum.

If the difference between two valuations is more than 20% of the maximum marks, the Registrar (Evaluation) shall check the entries and the total marks assigned by the two valuers. If there is any mistake in totalling, it shall be rectified. While checking the total, if it is observed that any one or more of the answers is not valued by one of the valuers, the Registrar (Evaluation) shall advise internal members of the Board of Examiners to value that answer. After receiving the marks, the Registrar (Evaluation) shall make the necessary corrections. Despite all these corrections, if the difference between the two valuations is still more than 20%, the Registrar (Evaluation) shall refer such answer script to the Chairman of the BOE for arranging third valuation by the examiners from among the approved panel of examiners. The average marks of the nearest of two of three valuations shall be final.

ii) Practical Examination

The practical examinations shall be conducted and valued jointly by internal and external examiners. The internal and the external examiners shall be duly approved by the Register (Evaluation) on the recommendation of the Chairman of B.O.E.

12. PROJECT WORK:

Guide for the project work and Chairman of the Department should certify that the project work is a bonafide work of the candidate while submitting the dissertation for final assessment. The guide and the external examiner will value the project work and require the candidate to defend dissertation in a viva voce. A panel of three examiners consisting of a Chairman, an external examiner and the guide/co guide constituted by the Chairman of the B.O.E. and duly approved by the University will conduct the viva-voce examination of the Candidates.

Dissertation evaluation shall be done by internal and external examiners, who are identified by the Chairman of the panel constituted for the viva-voce examination and duly approved by the Registrar (Evaluation) on the recommendation of the Chairman of B.O.E. Internal guide shall be an internal examiner and an examiner in the panel duly approved by the University/external guide/co guide / shall be an external examiner. In case of external guides from the Software Industry / R&D organization/University, where the students carried their

project works during VI semester, to be invited as external examiners, such external examiners shall be approved by the Registrar (Evaluation) before commencement of the dissertation evaluation.

An internal guide assigned for a candidate shall evaluate the project progress through presentation/demonstration by the candidate before finalising the project work and internal assessment marks shall be submitted to the chairman before dissertation submission for evaluation.

13. RESULTS:

A candidate should obtain a minimum of 40% marks in each of the papers in the University examination and 50% marks including internal assessment marks. A candidate should obtain a minimum of 50% marks in the VI Semester (internal assessment, evaluation of dissertation and viva-voce put together). The candidates who have passed in all the semester examinations are eligible for the M.C.A. degree

14. CARRY OVER:

A candidate who fails in a lower semester examination may go to the higher semester, however,
a) No candidate shall be permitted to take the fifth semester examination unless he/she passes all the papers of the first semester examination and
b) No candidate shall be permitted to take the sixth semester examination unless he/she passes all the papers of the first and second semester examinations.

15. CLASSIFICATION OF RESULTS:

i) The results of the successful candidates at the end of VI semester shall be classified on the basis of aggregate marks obtained in all the six semesters.
ii) The candidates who pass all the semester examinations in the first attempt are eligible for ranks provided they secure 60% and above marks. The declarations of results are as follows -
   First Class with Distinction   70% and above
   First Class   60% and above but less than 70%
   High Second Class   55% and above but less than 60%
   Second Class   50% and above but less than 55%

iii) The results of the candidates who have passed the VI semester examination but not passed the lower semester examinations shall

be declared as NCL (not completed lower semester examinations). Such candidates shall be eligible for the degree only after completion of all the lower semester examinations.

16. POWER TO REMOVE DIFFICULTIES:

If any difficulty arises, the University may, by notification make such provision not inconsistent with the provisions of this regulation as it may appear to be necessary or expedient for removing the difficulty.

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SCHEME OF EXAMINATION

(Effect from 2008 - 09 and Onwards)

Course: MCA

FIRST Semester

Sl. No.	Subject Code	Subject	No. of hrs per Week		Exam duration (Hours)	Marks		Total
			Theory	Lab		Internal Asst.	University Exam	
1.	MCA-101	Digital Computer Fundamentals	4	-	3	25	75	100
2.	MCA-102	Programming in C	4	-	3	25	75	100
3.	MCA-103	Financial & Cost Accounting for Management	4	-	3	25	75	100
4.	MCA-104	Numerical Algorithms	4	-	3	25	75	100
5.	MCA-105	Discrete Mathematics	4	-	3	25	75	100
6.	MCA-106	C – Programming & Numerical Algorithms Lab	-	4	3	25	50	75
7.	MCA-107	Digital Computer and Information Technology Lab	-	4	3	25	50	75
Total			20	8	-	175	475	650

SECOND Semester

Sl. No.	Subject Code	Subject	No. of hrs per Week		Exam duration (Hours)	Marks		Total
			Theory	Lab		Internal Asst.	University Exam	
1.	MCA-201	Microprocessors & Computer Architecture	4	-	3	25	75	100
2.	MCA-202	Data Communications	4	-	3	25	75	100
3.	MCA-203	Operating Systems	4	-	3	25	75	100
4.	MCA-204	Object Oriented Programming Using C++	4	-	3	25	75	100
5.	MCA-205	Data Structures and Algorithms	4	-	3	25	75	100
6.	MCA-206	OOP & Data Structure Lab.	-	4	3	25	50	75
7.	MCA-207	Microprocessor and Operating Systems Lab	-	4	3	25	50	75
Total			**20**	**8**	**-**	**175**	**475**	**650**

THIRD Semester

Sl. No.	Subject Code	Subject	No. of hrs per Week		Exam duration (Hours)	Marks		Total
			Theory	Lab		Internal Asst.	University Exam	
1.	MCA-301	Database Management Systems	4	-	3	25	75	100
2.	MCA-302	Visual Programming Technologies	4	-	3	25	75	100
3.	MCA-303	Computer Networks	4	-	3	25	75	100
4.	MCA-304	Software Engineering	4	-	3	25	75	100
5.	MCA-305	Operations Research	4	-	3	25	75	100
6.	MCA-306	DBMS & Visual Programming Lab	-	4	3	25	50	75
7.	MCA-307	Computer Networks & Software Engineering Lab.	-	4	3	25	50	75
Total			**20**	**8**	**-**	**175**	**475**	**650**

FOURTH Semester

Sl. No.	Subject Code	Subject	No. of hrs per Week		Exam duration (Hours)	Marks		Total
			Theory	Lab		Internal Asst.	University Exam	
1.	MCA-401	Computer Graphics and Multimedia	4	-	3	25	75	100
2.	MCA-402	Internet Tools and Web Technology	4	-	3	25	75	100
3.	MCA-403	Compiler Construction	4	-	3	25	75	100
4.	MCA-404	Distributed Computing	4	-	3	25	75	100
5.	*MCA-405*	*Elective - I*	*4*	*-*	*3*	*25*	*75*	*100*
6.	MCA- 406	Computer Graphics and Internet Technology Lab	-	4	3	25	50	75
7.	MCA- 407	Compiler Construction and Distributed Computing Lab	-	4	3	25	50	75
8	MCA - 408	Mini Project and Domain Knowledge Seminar	1	-	-	50	-	50
	Total		21	8	-	225	475	700

List of Electives:

1. *MCA-405 (E1): Bioinformatics*
2. *MCA-405 (E2): Network Programming*
3. *MCA-405 (E3): Image Processing*
4. *MCA-405 (E4): Systems Administration*
5. *MCA-405 (E5): Artificial Intelligence*
6. *MCA-405 (E6): Soft Computing Paradigm*

FIFTH Semester

Sl. No.	Subject Code	Subject	No. of hrs per Week		Exam duration (Hours)	Marks		Total
			Theory	Lab		Internal Asst.	University Exam	
1.	MCA-501	Mobile Communication	4	-	3	25	75	100
2.	MCA-502	Advanced Database Management Systems	4	-	3	25	75	100
3.	MCA-503	Data Mining Techniques	4	-	3	25	75	100
4.	MCA-504	.Net Technologies	4	-	3	25	75	100
5.	MCA-505	Elective - II	4	-	3	25	75	100
6.	MCA-506	Data Mining Lab	-	4	3	25	50	75
6.	MCA-507	.Net Technologies Lab	-	4	3	25	50	75
7.	MCA-508	Mini Project and Domain Knowledge Seminar	1	-	-	50	-	50
Total			21	8	-	225	475	700

List of Electives:

1. MCA – 505(E 1) : E-commerce
2. MCA – 505 (E2) : Pattern Recognition
3. MCA – 505 (E3) : Parallel Processing and Advanced Computer Architecture
4. MCA – 505 (E4) : Embedded Systems
5. MCA – 505(E5) : Decision Support Systems
6. MCA - 505 (E6) : Cryptography and Network Security
7. MCA – 505 (E7) : Data Storage Technology

SIXTH Semester

Project work/ Dissertation Marks: 400

SEMESTER	FINAL SEMESTER PROJECT WORK		
	Project Dissertation valuation (Average of both Internal & External Guide)	VIVA-VOCE EXAM.	TOTAL MARKS
VI	300	100	**400**

Sl. No.	Subject Code	Subject
1.	MCA-501	Mobile Communication
2.	MCA-502	Advanced Database Management Systems
3.	MCA-503	Data Mining Techniques
4.	MCA-504	.Net Technologies
5.	*MCA-505*	*Elective - II*
6.	MCA-506	Data Mining Lab
6.	MCA-507	.Net Technologies Lab
7.	MCA-508	Mini Project and Domain Knowledge Seminar

List of Electives:

8.   *MCA – 505(E 1) : E-commerce*
9.   *MCA – 505 (E2) : Pattern Recognition*
10. *MCA – 505 (E3) : Parallel Processing and Advanced Computer Architecture*
11. *MCA – 505 (E4) : Embedded Systems*
12. *MCA – 505(E5) : Decision Support Systems*
13. *MCA - 505 (E6) : Cryptography and Network Security*
MCA – 505 (E7) : Data Storage Technolog

MCA-101: DIGITAL COMPUTER FUNDAMENTALS

Hours/Week: 4   **I A Marks: 25**

Exam Hours: 3   **Exam Marks: 75**

UNIT - I   - 12 Hrs

Computer Operation – Application of Computers to Problems, Scientific Applications, Business Applications, Components of Digital computer, Number Systems – Decimal, binary, octal and hexadecimal Number systems, Number Base Conversion, Binary addition and subtraction, Complements, BCD, negative number representation and operations, floating point representation.

UNIT – II   - 12 Hrs

Boolean algebra and Gate Networks – Boolean algebra, Evaluation of logical expressions, and standard forms, simplification of Boolean functions – map, tabulation method Logic Design, Digital Logic Gates, Wired OR and Wired AND Gates**.** Combinational logic – NAND, NOR circuits, Adders, Decoders, Multiplexers, ROM, PLA's and PALS

UNIT – III   - 12 Hrs

Sequential logic - Flip Flops, shift registers, counters, state diagram & state tables, Design of sequential circuits, Programmable Array of Logic cells. Arithmetic-logic unit – Half adder, Full adder, BCD adder, Magnitude Comparator, Multipliers, operation – study of typical ALU unit.

UNIT – IV   - 12 Hrs

Memory Element – RAMS – static, dynamic, ROMS, flexible disk storage system, magnetic disk memories and optical memories, Magnetic Tape, Tape Cassettes & Cartridges, and Digital Recording Techniques. Input-Output devices – Keyboards, Terminals, Printers, Alphanumeric codes, Cathode Ray tube Output Devices, Error detecting and correcting codes.

Text Books:

1. Thomas C. Bartee, "**Digital Computer Fundamentals**", Mc-Graw Hill Book Company.
2. Morris Mono M., "**Digital Logic and Computer Design**", PHIl.

Reference Books:

1. Morris Mano M, Kime .R. Charles, "**Logic And Computer Design Fundumentals**" (2nd Edition Updated)

MCA-102: PROGRAMMING IN C

Hours/Week: 4   **I A Marks: 25**

Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction to algorithms, Flow charts, tracing flow charts, Problem solving methods, Need for computer languages, Reading Programs written in C character set Identifiers and keywords. Data types, Declarations, Expressions, statements and symbolic constants, Input-output getchar, putchar, scanf, printf, gets, puts, functions.

UNIT – II   - 12 Hrs

Pre-processor command: #include, define, ifdef. Preparing and running a complete C program.Operators and expressions: Arithmetic, unary, logical, bit-wise, assignment and conditional operators, Library function, Control statements, nested loops, if else, switch, break, continue and go to statements, comma operator.

UNIT – III   - 12 Hrs

Arrays**:** Defining and processing, passing to a function, Multi dimensional arrays. Functions: Defining and accessing: passing arguments, Function prototypes, Recursion, Use of library functions, Storage classes, automatic, external and static variables. Strings: Operations on strings.

UNIT – IV   - 12 Hrs

Pointers: Declarations, Passing to a function. Operations on pointers, Pointers and arrays, Arrays of pointers. Sructures: Defining and processing, passing to a function, Unions. Pre processors, Data files**:** Open, close, create, process, Unformatted data files. Dynamic memory allocation.

Text Books :

1. E. Balagurusamy, "Programming in C", Tata McGrawhill Publishers

Reference Books:

1. Foster & Foster , "C by Discovery", Penram International Publishers, Mumbai.

2. Kernighan, B.W. and Ritchie, D.M., "The C Programming Language (ANSIC)", PHI.

3. Hutchison, R., "Programming in C", McGraw Hill, New York, 1990.

4. Johnsonburg, R., and kalin, M., "Applications programming in C". Prentice Hall of India, 1989.

5. Rajaraman, V., "Computer Programming in C", Prentice Hall of India, New Delhi, 1995.

6. Smarjith Ghosh, "Programming in C", Prentice Hall of India , New Delhi

MCA-103: FINANCIAL & COST ACCOUNTING FOR MANAGEMENT

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Financial Accounting, Accounting standards, concepts and conventions, Books of Accounts, Accounting Mechanics leading to preparation of final statements, Trial balance and Adjustments, Profit and Loss account and Balance sheet, Assets, Liabilities and owners equity, Functions and managerial uses of Balance Sheet, Income Statement, Nature of Revenue & Expenses, Functions and uses, Methods of inventory valuation/ depreciation methods. (Illustrative Problems)

UNIT – II   - 12 Hrs

Statement of change in financial position meaning of the term 'FUND', preparation of fund flow statements, cash basis, working capital basis, Managerial uses. (Illustrative Problems). Financial Analysis, Accounting ratios, Liquidity, leverage, Activity, Profitability Ratios, Managerial uses and limitations. (Illustrative Problems).

UNIT – III   - 12 Hrs

Costing, Nature of Costs, Elements of manufacturing and non-manufacturing costs, Product & period costs, Cost concepts for planning and control, Budgets and standard costs, Fixed and variable costs, Costs of capital. (Theory only). Cost-Volume-profit & REP Analysis: Determining BEP and MOS, REP and profit goals, P/V or Contribution analysis, Uses and limitation. (Illustrative Problems). Variable or Marginal costing, Nature of variable costing, product and period costs, Pricing, Make or buy, Drop product, shutdown decisions, Uses and limitations. (Illustrative Problems).

UNIT – IV   - 12 Hrs

Budgeting: A systematic approach to profit planning, clarification of budgets, Processes, Preparation of cash, sales, production, Working capital, Flexible budgets and capital budgets, Methods of ranking, payback, Accounting rate of return, discounted cash flow techniques (NPV & IRR Methods). (Illustrative Problems). Standard costing, nature and significance, concept of standard costs, setting standards, variance analysis for control, material and labour cost variances, subvariance. (Illustrative Problems).

Text Books:

1. I.M. Pandey, "Elements of Management Accounting", Vikas Publishing House.

Reference Books:

1. S. K Bhattacharya, "Accounting for Management", Vikas Publishing House
2. Bhabathosh Banergee, "Financial Policy & Management Accounting", World Press Pvt. Ltd Calcutta
3. Dr. S. P Gupta, "Management Accounting", Sahitya Bhavana, Agra.

4. R. L Gupta, Radhaswamy, "Financial Accounting", Vol I, II, III, IV, Sultan Chand.
5. Dr. S. N Maheshwari, "Cost & Management Accounting", Vikas Publishing House.
6. Dr. N.P Srinivasan, "Management Accounting", sterling publication.
7. M N Arora, Cost and Management Accounting, Himalaya Publishing House.
8. Jawaharlal, Advanced Management Accounting, S. Chand
9. R.P Rustagi, Management Accounting, Galgotia Publishing.

MCA-104: NUMERICAL ALGORITHMS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT-I

REVIEW
Approximations and errors, Roots of equations, Simultaneous equations.   - **6 Hrs.**

CURVE FITTINGS
Linear Regression, Polynomial Regression, Multiple Linear Regression, General Linear Least squares, Nonlinear Regression.   - **6 Hrs.**

UNIT-II

INTERPOLATION
Newton's Divided – Difference Interpolating polynomials, LaGrange Interpolating Polynomials, Coefficients of an Interpolating Polynomials, Inverse Interpolation, additional Comments, Spline Interpolation, Matrix theory, Gauss Elimination
         - **12 Hrs**.

UNIT-III

INTEGRATION
The Trapezoidal Rule, Simpson's rules, Integration with Unequal segments, Open Integration formulas, Newton – Cotes algorithms foe equations, Romberg integration, Gauss quadrature, Improper Integrals.   **- 12 Hrs**.

UNIT-IV

FINITE ELEMENT METHODS
The General approach, Finite Element Application in One Dimension, Two Dimensional Problems, PDEs with Libraries and Package.   - **12 Hrs.**

Text Books :

1. Steven C Chapra & Raymond P.Canale, Numerical Methods for Engineers, 3 rd Edition, WCB/ McGraw – Hill International Edition, 1998.(Chapter No. 3,17,18, PT 4.1,13, 15.1 - 15.3, 21, 22, 31)

Reference Books:

1. Curtis. F. Gerald, Patrick. O. wheatley, Applied Numerical analysis, 5th edition, Addision Wesley. 1998.
2. Samuel D.Conte/Carl De.Boor, Elementary Numerical analysis- an Algorithmic approach, 3 rd Edition McGraw Hill internationalEdition, 1981.
3. S.Arumugam, A. Thangapandi Isac, A. Somsundaram, "Numerical Methods"
4. M. K Jain, s.R Iyengar, R. K Jain "Numerical Methods for scientific and Engineering Computation" , Wiely Eastern Edition, 1985
5. John R. Rice, " Numerical Methods- A Computer Oriented approach"

MCA-105: DISCRETE MATHEMATICS

Hours/Week: 4	**I A Marks: 25**
Exam Hours: 3	**Exam Marks: 75**

UNIT – I - 12 Hrs

Graph Theory: Definition, Paths, reach ability, and connectedness. *Theory of Computation:* Introduction, Strings and their properties, Formal Languages, Types of Grammars and Languages, Chomsky classification of Languages, Recursive and recursively enumerable sets, Operations.

UNIT – II - 12 Hrs

Review of Sets, Logic, Propositions, connectives and normal forms, Relations, Functions: Permutations and combinations Recurrence Relations and Recursive Algorithms: Introduction to Probability theory and Queuing Theory: Introduction, Sample space-random variables - probability distributions, expected values, joint distributions, variance, covariance, Models - m/m/k and m/g/k, finite queues and their steady state behavior, Computer science applications, Introduction to randomized processing

UNIT – III - 12 Hrs

Theory of Automata: Finite State Models –Regular sets, NFA, DFA, Minimization, Regular Grammars, Pumping Lemma, Closure properties. *Context Free Languages*: Context Free Grammar and Push down Automata, Decision Algorithms for CFL.

UNIT – IV - 12Hrs

Turing machines and Linear bounded Automata: TM model, Representation and Design of TM, Linear bounded automata and Languages, Halting problem, Universal TM and modifications.

Text Books:

1. Elements of Discrete Mathematics – C L Liu, McGraw-Hill
2. Theory of Computer Science- KLP Mishra and N Chandrashekar, PHI
3. Probability and Statistics with Reliability, Queuing and Computer Science applications, K. S. Trivedi, Prentice Hall of India.

Reference Books:

1. Gems of Theoretical Computer Science - U.Schoninz, R J Pruim
2. Elements of the Theory of Computation - Hary R Lewis, Christor H Papadi metrion.
3. Introduction to Automata Theory, Languages and Computation- JD Ullman et al.
4. Kolman, B., Busby, R. and Ross. Discrete Mathematical Structures for computer Science (Third Edition) Prentice Hall of India 1987.
5. Sahni, S., Concepts in "Discrete Mathematical Structures with Applications to computer science" McGraw Hill 1987.
6. Athanasis Papoulis, S. Unikrishna Pillai, "Probability, Random Principles and Stochastic processes"
7. S. P Gupta, " Fundamentals of Statistics"

MCA-106: C – PROGRAMMING & NUMERICAL ALGORITHMS LAB

(Based on MCA-102 & MCA-104)

Hours/Week: 4   I A Marks: 25
Exam Hours: 3   Exam Marks: 50

MCA-107: DIGITAL COMPUTER & INFORMATION TECHNOLOGY LAB

(Based on MCA-101 & MCA 103)

Hours/Week: 4   I A Marks: 25
Exam Hours: 3   Exam Marks: 50
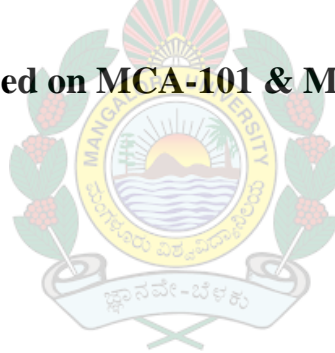
II Semester
MCA - 201: MICROPROCESSORS AND COMPUTER ARCHITECTURE

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **ExamMarks: 75**

UNIT -I   - 12 Hrs

Principal of Computer Design – Software hardware interaction layers in computer architecutre.General processing unit. Machine language instructions. Addressing modes, instruction types, instruction set selection, Instruction cycle and execution cycle.Control unit, Data path and Control path Design – Microprogramming Vs Hardwired Control, RISC Vs CISC, Pipelining in CPU design; Superscalar Processors.

UNIT - II   - 12 Hrs

Memory System – Storage technologies, Memory array organizaiton, Memory hierarchy, interleaving, cache and virual memories . Input-output devices and characteristics Input-output processing, bus interface, data transfer techniques, I/O interrupts, channels.

UNIT - III   - 12 Hrs

Microprocessors:Introduction – Historical evolution of Microprocessors; Architecure of 8086, Memory & register organization; Data and instruction formats, Addressing modes, Intructions set, Data movement, Arithmetic and logic instructions.

UNIT - IV   - 12 Hrs

Program Control instructions. Assembly language programming – Simple programs, Subroutines – Linkage and parameter passing; I O Programming; Bus structures, Introduction to 80386, 80486, Pentium.

Text Books :

1. Stallings, W., "Computer Organizaiton and Architecture'' (2nd Edition), Prentice Hall of India, New Delhi.
2. Microprocessors & interfacing programming & hardware-Douglas V Hall(2nd edition), Tata McGraw Hill.

Reference Books:

1. Mano, M. "Computer System and Architecure'', (3rd edition), Prentice Hall of India, New Delhi 1994.
2. Pal Chauduri, P., "Computer Organization and Design''m Prentice Hall of India, New Delhi, 1994.
3. Microcomputer systems:9086/8088 family – Liu, Gibson
4. Burru M Bery, "Introduction to Microprocessors", PHI, 1991.
5. "Assembly Language Programming", Schaum Series.
6. D.V. Hall. "Microprocessors and interfacing", Tata McGraw-Hill.

MCA-202: DATA COMMUNICATIONS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction : Data communications fundamentals, Communication model, computer communications architecture, Data Communication tasks, Data Communication Systems Applications , Data Communication System Characteristics features, Data Communication Network criteria, Protocols and standards, Standards Organisations, Line Configuration, Topology, Transmission mode, Categories of Networks. Signals: Analog / Digital data and Signals, Periodic and Aperiodic Signals, Time and Frequency Domains, Composite Signals. Transmission rate, Bit rate, Baud rate and signal levels, Channel capacity using Nyquist and Shannon's relation .

UNIT – II   - 12 Hrs

Encoding and Modulating : Digital to Dogital Conversion, Analog to Digital Converion, Analog to Analog Conversion, Digital to Analog Conversion, Modulation and Demodulation: Data modulation methods: ASK, FSK, PSK, QAM, PCM, PAM, POLAR, BIPOLAR, NRZ, RZ. Transmission of Digital data : Interfaces and Modems: Digital Data transmission, DTE-DCE interface, Other Interface Standards , Modem features , Types of Modem and functions of MODEM. Transmission media, Guided media, Unguided media, Transmission impairments and Performance.

UNIT – III   - 12 Hrs

Multiplexing : Many to One / One to many , Frequency Division Multiplexing (FDM), Wave Division Multiplexing (WDM), Time Division Multiplexing (TDM), Multiplexing applications, Digital Subscriber Line, ADSL. Error Detection and Error Correction: Types of errors, Detection, VRC, LRC, CRC performance, Checksum, Error correction, Single Bit Error Correction and Hamming code. Data Link Control: Line Discipline – POLL / Select, Flow Control – Stop and Wait , Error Control - ARQ.

UNIT – IV   - 12 Hrs

Data Link protocols: Asynchronous protocols - Kermit, Synchronous Protocols: Character – Oriented Protocols - BSC, Bit – Oriented Protocols – SDLC/HDLC, Link Access Procedure - LAPB. Switching: Circuit Switching - PSTN, Packet Switching - PSDN, Message Switching. Point – to –Point Protocol (PPP), Integrated Services Digital Network (ISDN): Services, History, Channels, Goals, Features and Applications and Architecture. The ISDN Layers, Broadband ISDN (BISDN). X.25: X.25 Layers X.25 protocols. Frame relay, ATM.

Text Books:

1.   William Stallings – Data & Computer Communications, PHI (6th ed.).
2.   W. Tomasi – Advanced Electronic Communication Systems.

Reference Books:

1.   Behrouz A Forouzan - Data Communication & Networking, McGraw Hill, 2nd ed., 2000.
2. James Martin – Telecommunications & the Computer, PHI, 3rd ed.
3. PC Gupta – Data Communications, PHI, 2001.

MCA-203: OPERATING SYSTEMS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction to operating systems & their classification: What is an operating system, Mainframe systems, Desktop systems, Multiprocessor system, Distributed system, Clustered system, Real time system, Hand held system, Feature migration, computing environments. System components, OS Services, System calls, System programs, System structure, Virtual machines.

Process , Inter process Communication , Threads & CPU Scheduling: Process concept, Process scheduling, Operation on processes, Cooperating processes, Inter process communication. **Threads** - Overview , Multithreading models, Threading issues, Pthreads, Java threads. **CPU scheduling** - Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling , Real time scheduling.

UNIT – II   - 12 Hrs

Process Synchronization and handling Deadlocks: The Critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, monitors. Deadlock - System model , Deadlock characterization, Methods for handling deadlocks - Deadlock prevention , deadlock avoidance, Deadlock detection and recovery from deadlock.

UNIT – III   - 12 Hrs

Storage Management: Main memory management - Background, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging Virtual memory - Background, Demand paging, Process creation, Page replacement algorithms, Allocation of frames, thrashing. File System interface - File concept, Access methods, Directory structure, File system mounting, File system implementation, Directory implementation, Allocation methods, Free space management. Mass storage structures – Disk structure, Disk scheduling methods, Disk management, Swap space management.

UNIT - IV   - 12 Hrs

Protection and Security : Goals of protection , Domain of protection, Access matrix , implementation of access matrix, Revocation of access rights, The security problem, Authentication, Program threats, System threats, Securing systems and facilities, Intrusion dectection, Cryptography .

Case Study - Linux operating system: Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and output, Interprocess communication.

Text books:

1. Operating System Concepts by Abraham silberschatz, Peter Baer Galvin , Greg Gagne, 6th edition, Jhon wiley & Sons 2002,2003. Chapters: 1 , 3.1 to 3.6 , 4 (except 4.6) , 5 (except 5.5 to 5.7) 6 (except 6.6 , 6.7), 7 (except 7.8 to 7.10), 8, 9, 10 (except 10.4.5,10.7,10.8), 11(except 11.5,11.6), 12(except 12.6 to 12.9), 14 (except 14.5 to

14.8), 18(except 18.6,18.7), 19(except 19.7.3,19.7.4,19.8,19.9), 20 (excerpt 20.1,20.10,20.11).

Reference Books:

1. Operating system concepts and design by Milan Milankovic II edition Mcgrawhill 1992.
2. Operating systems by Harvey M Deital Addison wesley 1990
3. Operating systems - A concept based Approach, D.M Dhamdhere Tata Mcgrawhill 2002.

MCA-204: OBJECT ORIENTED PROGRAMMING USING C++

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs
The Basic Language: Object – oriented programming. Encapsulation. Polymorphism, Inheritance. The C++ Program – Preprocessor directives, A word about comments, a first look at input/output, C++ data types – pointer types, string types, const qualifier, Reference types, the bool type, enumeration types, array types, complex number types, typedef names, volatile qualifier, The new and delete expressions, Type conversions.

UNIT – II   - 12 Hrs
Procedural – Based Programming: Functions – overview, function prototype, argument passing, Returning a value, recursion, inline functions, linkage directives, main(): handling command line options, pointers to functions, Scope and lifetime – scope, global objects and functions, local objects, dynamically allocated objects. Overload function – overloaded function declarations, the three steps of overload resolution, argument type conversions.

UNIT – III   - 12 Hrs
Class and Objects : Introducing C++ classes, constructors and destructors, Classes, structures and classes, unions and classes – anonymous unions, friend functions, friend classes, inline functions – inline functions within a class. Parameterized constructors, static class members – Static data members, Static member function, Execution of constructors and destructors, the scope resolution operator, nested classes, local classes, passing objects to functions, returning objects, object assignment. Arrays of objects – initialization v/s un initialization, Pointers to objects, Type checking pointers, This pointer, Pointers to derived types, pointers to class members. Creating a member operator function – overloading shorthand operators, operator overloading, and restriction. Operator overloading using a friend function – Using a friend to overload ++ or --, overloading some special operator – overloading [], ->, overloading the comma operator.

UNIT – IV   - 12 Hrs
Inheritance, Virtual functions and I/O Stream library: Inheritance – Base class access control, Inheritance and protected members – protected Base class inheritance. Inheriting multiple Base classes, Constructors, Destructors and Inheritance – Execution of constructors and destructors, passing parameters to base class constructors, granting access, virtual base classes.
Virtual Function – Calling a virtual function through a base class reference, The virtual attribute is inherited, virtual functions are hierarchical pure virtual function – abstract classes, using virtual function, early and late binding, Templates, Exception handling, File Handling.

Text books:

1. C++ Primer by Stanley B. Lippman and Josee Lajore, Addision Wesley, 3rd Edition,
2. C++, The Complete Reference by Herbert Schildt, TMH, 3rd Edition,.
3. Object Oriented Programming in MS C++, by Robert Lafore, Galgotia Publications

Reference books:

1. Standard C++ by Paul S. Wang, Thomson Learning, Vikas publishing house, 2nd edition, 2001.
2. The C++ Programming language by Bjarne Stroustrup, Pearson Education, 3rd Edition.
3. Object oriented Programming using C++ , E. Balagurusamy , Tata MacGrawhill Publishers.

MCA-205: DATA STRUCTURES AND ALGORITHMS

Hours/Week: 4   **I A Marks: 25**

Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Algorithm: Definition, aprioir and aposteriori analysis, time complexity and space complexity. Abstract Data Types: Arrays, Polynomial, Sparse Matrices, Strings, Stacks & Queues, Multiple Stacks & Queues –Application of Stacks-Postfix, Prefix representation and Evaluation, Application of Queue- Priority Queue, Simulation.

UNIT – II   - 12 Hrs

Linked Lists: Singly Linked Lists, Reusable Linked List Class, Circular Lists, Linked Stacks & Queues, Polynomials, Sparse Matrices, Doubly Linked Lists, Generalized Lists. *Trees:* Introduction - Binary Trees - Binary Tree Traversal - Additional Binary Tree Operations - Threaded binary Trees - Binary Search Trees - Selection Trees - Forests - Set Representation,

UNIT – III   - 12 Hrs

Graphs: Elementary Graph Operations - Minimum Cost Spanning Trees - Shortest Paths & Transitive Closure, Graph traversals. *Symbol Table:* Static Hashing - Dynamic Hashing, Heap Structures - Min-Max Heaps, Binomial Heaps.

UNIT – IV   - 12 Hrs

Sorting: Motivation - Insertion Sort - Quick Sort -Merge Sort - Heap Sort - Sorting on Several Keys - List & Table Sort - Summary of Internal Sorting - External Sorting Hashing.

Text Book:

1.   Fundamentals of Data Structures in C, ELLIS HOROWITZ, SARTAJ SAHNI and DINESH MEHTA, 1995.

Reference Books:

1. Data structures and Algorithms, AHO, HOPCROFT and ULLMAN, Addison Wesley, 1983.
2**.** Data structures using C and C++ - Langsam, Augenstein, Tanenbaum, and PHI.
3. "Data structures and Program Design" by Robert L. Kruse

MCA-206: OOP & DATA STRUCTURE LAB.
(Based on MCA-204 & MCA-205)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

MCA-207: MICROPROCESSOR AND OPERATING SYSTEMS LAB
(Based on MCA-201 & MCA-203)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

III Semester

MCA-301: DATABASE MANAGEMENT SYSTEMS (DBMS)

Hours/Week: 4   **IA Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT - I   - 12 Hrs
Introduction and conceptual modeling: Databases and Database Users, Characteristics of the Database approach, Advantages of using the DBMS approach Database system concepts and architecture, Data models, schemas, and instances Three-schema architecture and Data Independence, Database languages and interfaces, The Database System Environment, Centralized and Client-Server architectures, Classification of database management systems.
Data Modeling Using the Entity-Relationship Model, Using high-level conceptual data models for database design, ER diagrams, Naming conventions, and design issues, Notation for UML Class Diagrams.
Enhanced Entity-Relationship and UML Modeling: Subclasses, Super classes, and Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and generalization, Modeling of UNION Types using categories.

UNIT – II   - 12 Hrs
Relational Model: The Relational Data Model and Relational Database Constraint, Relational Model concepts, Relational Model constraints and Relational Database schemas, Update operations, Relational Algebra and Relational Calculus, Unary Relational Operations-SELECT and PROJECT, Relational Algebra operations from set theory, Binary Relational Operations-JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus
Relational Database Design: ER- and EER-to-Relational mapping, ER-to-relational mapping, mapping EER Model concepts to Relations.
SQL: Definition, Constraints, and Queries, SQL Data Definition and Data Types, Specifying basic constraints in SQL, Schema change statements in SQL Basic and complex queries in SQL, Insert, Delete, and Update Statements in SQL, Programming features of SQL.

UNIT – III   - 12 Hrs
Database Design Theory And Methodology: Functional Dependencies and Normalization for Relational Databases, Design guidelines for Relation Schemas, Functional Dependencies, Normal Forms based on primary keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Relational Database Design Algorithms and Further Dependencies, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms.
Query Processing and Optimization: Translating SQL Queries into Relational Algebra Basic Algorithms for Executing Query Operations, Query optimization techniques.

Transaction processing concepts: Introduction to Transaction Processing, Concepts and Theory, Introduction to transaction processing, Transaction and system concepts, Properties of transactions, Characterizing schedules based on recoverability, Characterizing schedules based on serializability, Transaction support in SQL.

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control, Concurrency Control based on Timestamp ordering, Multi-version concurrency control techniques, Validation (Optimistic) concurrency control techniques, Granularity of data items and multiple granularity, Locking, Locks for Concurrency Control in Indexes, Other Concurrency Control Issues

Database Recovery Techniques: Recovery concepts, Recovery techniques based on deferred update, Recovery techniques based on immediate update, Shadow paging, The ARIES recovery algorithm, The Two-Phase commit protocol, Database backup and recovery from catastrophic failure.

Text Books:

1. Fundamentals of Database Systems, Ramez Elmasri, Shamkant B. Navathe, Fourth Edition.

Reference Books:

1. Database Management Syatem by Alexis Leon and Mathews Leon , Lion Vikas Publishers
2. Introduction to Database Systems, Bipin C. Desai, Galgotia Publications.
3. SQL, PL/SQL by Ivan Bayross.
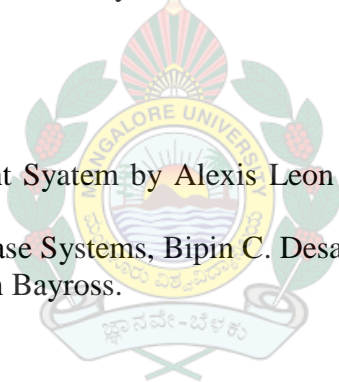
MCA-302: VISUAL PROGRAMMING TECHNOLOGIES

Hours/Week: 4   **I A Marks: 25**

Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction to MFC and the Visual C++ IDE : Understanding the MFC Class Hierarchy, Understanding How MFC Encapsulates WinMain Overview of the Visual C++ Integrated Development Environment (IDE) .**MFC Application Architectures:**MFC Document/View Architecture, Non-Document/View MFC Applications, Specialized View Classes, Implementing Dynamic and Static Splitter Windows.

MFC Support for Graphical Output : Drawing in the View Class Using Device Context and GDI Classes, Mapping Modes and Coordinate Mappings, Memory Device Contexts, BitBlt, and Double Buffering, MFC Print and Print Preview Support **Message Maps and CCmdTarget Derived Classes :**ClassWizard and the WizardBar for Message Handling, MFC Message Maps and Macros, Command Routing, and Testing with Spy++.

UNIT – II   - 12 Hrs

Expressive User Interface Elements: Menus ,Implementing Static Menus, Implementing Dynamic Menus, Implementing Context Menus, Implementing Owner-Drawn Menus.**Expressive User Interface Elements: Toolbars and Status Bars** Toolbars and Control Bars in MFC, Implementing Status Bars .**Modal and Modeless Dialog Boxes** Modal Dialog Boxes, Modeless Dialog Boxes **Exception Handling and MFC Debugging Support**

Overview of Exception Handling and Error Handling, MFC Debugging Macros and Classes, and Visual C++ Debugging Support

UNIT – III   - 12 Hrs

Database Programming with MFC : Accessing Data Using ODBC Classes, Accessing Data Using DAO Classes, Accessing Data Using OLE DB Template Classes, Accessing Data Using ADO Components .**MFC-Based ActiveX Controls and ActiveX Control Containers**

Creating MFC ActiveX Controls, Creating ActiveX Control Containers and Servers .**Using MFC Classes for Internet Programming :**Internet-Enabled Applications and Using the Microsoft Web Browser Control, Programming with the WinInet Classes, Windows Sockets Programming with MFC, ISAPI Programming .

UNIT – IV   - 12 Hrs

Persistence Using MFC Serialization Support and the Registry : Using CFile and CArchive, and Implementing Serialization in MFC, Personalized User Settings and the Registry .**Multithreaded Programming in MFC :**Overview of Multithreading and CWinThread, and Using AfxBeginThread(), Synchronization of MFC Threads.**MFC State Information and MFC Regular and Extension DLLs :**MFC State Information, and Developing MFC Dynamic Link Libraries .

Text Books:

1. ''Learn Microsoft® Visual C++® 6.0 Now'', Chuck Sphar, Microsoft Press
2. ''Microsoft® Visual C++® 6.0 Programmer's Guide'', by Beck Zaratian.

3. ''VC++'' , by Yashwanth Kanitkar, BPB Publications

Reference Books :

1. ''The complete reference to Visual C++'', by Pappas, Murray
2. ''Programming MS Visual C++'', Fifth Edition by David J. Kngglisk, George Shepheed, Scot Dingo, Microsoft Press.
3. ''Visual C++ A Developers Guide'', Alexis Leon by Vikas Publishers

MCA - 303: COMPUTER NETWORKS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction: Review of Basic fundamentals of Data Communication Networks , ISO-OSI Architecture, Functions and Services of Physical, Data link, Network, Transport, Session, Presentation and Application Layers. Classifications of Computer Networks: Local Area Network (LAN), Wide Area Network WAN, Metropolitan Area Network, Storage Area Network (SAN), Public and Private Networks, Value Added Network (VAN), Internet works, TCP /IP reference Model, Novell Netware Reference Model. Standards of Networks. Distributed Applications

UNIT – II   - 12 Hrs

Physical and Data Link Layer Services: PPDU, Physical Media Charactersitcs, Project 802, DPDU, LLC, MAC, PDU, Ethernet – Access Methods – CSMA/CD, Other Ethernet Networks, Token Bus, Token Ring, FDDI. Switching Techniques, Point – to – Point Protocol (PPP),Link Control Protocol (LCP), INETERNETWORK types, Network Control Protocol (NCP), Network Layer Services: Networking and Internetworking Technology Devices, Repeaters, Bridges, Routers, Gateways and Other Devices., Routing Algorithms, Congestion Control.

UNIT – III   - 12 Hrs

TCP/IP Protocol Suit: Overview of TCP/IP, TCP/IP and the Internet, TCP/IP and OSI, Internetwork Protocol (IP), Classes of IP, Addressing, Subnetting, Other Protocols in the Network Layer, Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP), Internet Control MESSAGE Protocol (ICMP), Internet Group Message Protocol (IGMP), Transport Layer Services: Functionalities of the Transport Layer, Connection, The OSI Transport Protocol, TPDU. Telnet, FTP.

UNIT – IV   - 12 Hrs

Upper OSI Layers: Session Layer Services: Session and Synchronization management, SPDU. Presentation Layer Services:Application layer Services: Translation, Encryption, Decryption, Data Compresssion, PPDU. Application Layer Services: Client / Server Model,, BOOTP, Dynamic Host Configuration Protocol(DHCP), Domain Name System (DNS), Telnet, Fle transfer Protocol (FTP), Trivial File Transfer Protocol (TFTP),Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP), Simple Network Management Protocol (SNMP), Hyper Text Transfer Protocol (HTTP) , World Wide Web (WWW).

Text Books :

1. Forouzan, B.A., "TCP/IP Protocol", TMH
2. Laura Chappell (ed), "Introduction to Cisco Router Configuration", Techmedia, 1999.
3. Behrouz A Forouzan - Data Communication & Networking, McGraw Hill, 2^(nd) ed.,
    2000.

Reference Books:

1. Tananbaum A.S., "Computer Networks", 3rd Ed, PHI, 1999.
2. Black U., "Computer Networks-Protocols, Standards and Interfaces", PHI, 1996.
3. Stallings W., "Computer Communication Networks", PHI.
4. Stallings W., "SNMP, SNMPv2, SNMPv3, RMON 1&2", 3rd Ed., Addison Wesley, 1999.
5. Michael A. Miller, "Data & Network Communications", Vikas Publication.
6. William A. Shay, "Understanding Data Communications & Networks", Vikas Publication.

MCA-304 : SOFTWARE ENGINEERING

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT -I   - 12 Hrs

Introduction to s/w Engineering:The s/w problem, S/w engineering problem, s/w engineering approach.S/w processes:S/w process, characteristics of a s/w process, s/w development process, project mgt process, s/w configuration management process.

UNIT - II   - 12 Hrs

Software requirements analysis and specifications:s/w requirements, problem analysis, reqiuremnet specification, validation, metrics.Planning a s/w project:Cost estimation, project scheduling, staffing & personnel planning, quality assurance plans, project monitoring plans, risk management .

UNIT - III   - 12 Hrs

System & detailed design:Design principles, module level concepts, design methodologies, structured design methodology & object oriented design, verification and metrics.Coding:Programming practise, verification, metrics.

UNIT – IV   - 12 Hrs

Testing:Fundamentals, functional & structural testing, testing process, metrics.Software Engineering tools and environment:Process models, 4th generation techniques, technical metrics for Software .

Text Books:

1. R. S. Pressman, "Software Engineering: A practioner's Approach", McGraw Hill.

Reference Books :

2. Ian Sommerville, ,''Software Engineering'', Seventh Edition, Person Education, 2005.
3. Ali Behforooz and Freedrick J. Hudson, "Software Engineering Fundamentals", Oxford University Press, 2004.
4. Pankaj Jalote, "An Integrated Approach to Software Engineering, Narosa Publishing House.
5. Fundamentals of s/w Engineering – Carlo Ghezze, Mehde Jazayeri, Dino Mandrioli
6. Software engineering – shooman
7. Software engineering – Wattmanh.

MCA-305: OPERATIONS RESEARCH

Hours/Week: 4　　　　　　　　　　　**I A Marks: 25**
Exam Hours: 3　　　　　　　　　　　**Exam Marks: 75**

UNIT – I　　　　　　**- 12 Hrs**

Introduction: Nature and developments of operations research, characteristics of operations research, necessity of operations research in industry, scope of OR in management, objectives of OR, models in OR, role of computers in OR, limitations of OR.

Linear Programming: Requirements of linear programming problems, formulation of linear programming problem, graphical solution, simplex algorithm, computational procedure in simplex, duality and its concept, application of L.P. model to product mix and production scheduling problems, limitations of linear programming.

UNIT – II　　　　　　**- 12 Hrs**

Transportation model: Definition of transportation model, formulation and solution methods, and degeneracy in transportation problems.
Assignment Model: Definition of assignment model, comparison with transportation model, formulation and solution methods, the traveling salesman problem.

UNIT – III　　　　　　**- 12 Hrs**

Queuing Models: Application of queuing models, characteristics of queuing models, single channel queuing theory, solution to single channel with poison arrivals and exponential service infinite population model, Industrial applications of queuing theory.
Simulation: When to use simulation, Advantages and limitations of the simulation technique, generation of random numbers, Monte-Carlo simulation, computer-aided simulation: applications in maintenance and inventory management.

UNIT – IV　　　　　　**- 12 Hrs**

Game Theory & Network Analysis: PERT and CPM: Work breakdown structure, network logic, critical path, CPM Vs PERT, slack and floats. Game theory : Pure strtegies and Mixed strategies. Application of software skill in Operations Research .

Text / Reference Books:

1. Operations Research by P.K. Gupta and D.S.Hira. S. Chand and company
2. Operation Research -,An Introduction A.H. Taha Macmillan Publishing Co
3. Executive Decisions and operations Research by W.D. Miller and M.K Starr, Prentice Hall Inc, Eglewood Cliffs, N.J,
4. Introduction of Operations Research - Hillier and Lieberman
5. Fundamentals of Operations Research - Ackoff and Sasiene
6. Discrete-event system simulation – Jerry Banks, David M. Nicole, Barry L. Nelson

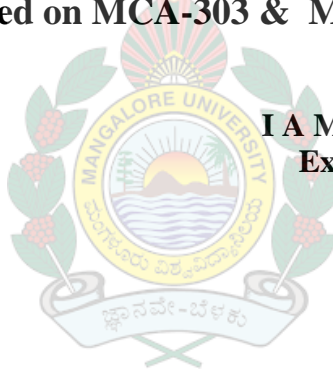## MCA-306: DBMS & VISUAL PROGRAMMING LAB
(Based on MCA-301 & MCA-302)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 50**

MCA-307: COMPUTER NETWORKS & SOFTWARE ENGINNERING LAB
(Based on MCA-303 & MCA-304)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 50**

IV Semester
MCA-401: COMPUTER GRAPHICS & MULTIMEDIA

Hours/Week: 4   **I A Marks: 25**

Exam Hours: 3   **ExamMarks: 75**

UNIT - I   -12 Hrs

Introduction to Graphics systems, Output primitives & attributes, Basic transformations & Composite transformations.Windowing and clipping, Hidden line removal algorithms.

UNIT - II   - 12 Hrs

3D concepts: Representation, Projectons, viewing , transformations with examples and problems, surface ellimination.

UNIT - III   - 12 Hrs

Display devices: Lines & point plotting systems(raster & vector) ,digital frame buffer, color display techniques, GKS, PHIGS.

UNIT - IV   - 12 Hrs

Multimedia:Introduction, media & data streams, music & sound, MIDI, images & graphics, vedio & animation, multimedia applications, multimedia & internet, authoring systems.

Text Books :

1. Computer graphics- Donald hearn & pauline baker(PHI).
2. Computer graphics- Zhigang Xiang & Roy Plastok
3. Multimedia system- Rajneesh agarwal , Bharat Bhushan Tiwari.
4. Multimedia-Computing, Communication & Applications- Ralf steinmetz, Klara Nahrstedt.

Reference Books:

1. Funadamentals of interactive computer graphics- Foley J.D, Van Dam
2. Procedural elements of computer graphics- Roger D.F
3. Principles of interactive computer graphics- Newman w, Sproul R.F

MCA-402: INTERNET TOOLS AND WEB TECHNOLOGY

Hours/Week: 4   **I A Marks: 25**

Exam Hours: 3   **ExamMarks: 75**

UNIT – I   - 12 Hrs

Overview of Internet & Web : Basics of Internet , Networking & Web concepts . Network topologies , types & layers. Internet & Web protocols like TCP/IP, ARP, RARP, PPP, Telnet, ftp etc. Subnets & Hosts, WWW, Domain Names, Websites, Browsers, Search Engines, Counters, Internet Chat etc. Hardware & Software requirements for Internet & Web based applications. Overview of various Internet & Web technologies.

UNIT – II   - 12 Hrs

Web Design : Key issues in web site design , Structure of a Web Page . Introduction to HTML, Head & Body Sections, Content layout and presentation, Various HTML Tags, Table Handling , Frames. Basic & Advanced HTML, Distributing Information, Blocks, Tags, Document Creation, Linking, Handling Images, Graphics navigation, Tables, Style sheets.

UNIT – III   - 12 Hrs

Techniques & Tools : Graphics & Animation techniques . Usage of various web based tools like Microsoft Front page, Macromedia Dream Weaver, Adobe photoshop, Ulead Gif Animator, Macromedia Flash etc.

Interactivity & Security : Client Server Model, Creating interactive dynamic HTML Forms. CGI , Role of databases in interactive applications. Server issues & Security methods like firewalls etc .*CGI Scripts*: Introduction, Uses, Development, Scripting, Languages, Resources

UNIT – IV   - 12 Hrs

Active Server Pages : *Creating interactive applications using active server pages* : Client & server side script in VBScript, Variables & Constants, creating modules, creating objects from classes, using ASP's Object Model, Arrays, Collections , Control Structures, using request & response objects .Integration with database. Overview & usage of various other internet & web based technologies like JSP , PHP, Java Applets, Java Script , E-Commerce, etc. Concept of Web Engineering.

Text Books:

1. Internet and Web Technologies by Raj Kamal , TMH
2. Web publishing by Monica D'Souza , TMH
3. Active Server Pages by Heith Morneau, Vikas Publishing House

Reference Books:

1. Web Design by David Crowder and Rhonda Crowder, IDG Books India
2. Database Driven Web Sites by Mike Morrison , Vikas Publishing House
3. Mark Swank & Drew Kittel, "World Wide Web Database", Samsnet.
4. ASP 3 Programming , Eric A. Smith , IDG Books India.

MCA-403: COMPILER CONSTRUCTION

Hours/Week: 4   **I A Marks: 25**

Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction to Language Processing: Language processing activities - Fundamentals of language processing - Fundamentals of language specification - Language processor development tools, Data structures for Language processing. **Lexical Analysis**: Input buffering, Specification and Recognition of tokens, Design of Lexical analyzer generators, Usage of LEX utility.

UNIT – II   - 12 Hrs

Syntax Analysis:

Role of Parser, Top-down parsing:- Recursive descent and Predictive parsing, (LL(1), Parser), PRD Bottom-up parsing:- Operator precedence parser, LR-parser:- SLR, LR(1), LALR, Usage of YACC utility.

UNIT – III   - 12 Hrs

Intermediate Code Generation: Semantic actions and Syntax directed translations, Intermediate representations, Bottom-up and Top-down translations.

UNIT – IV   - 12 Hrs

Code Optimization and Code Generation: Symbol table, Machine independent and Machine dependent optimization aspects, Code generation issues.

Text Book:

1. A.V. Aho and J.D. Ullman: principles of compiler Design, Addison Wesley, 1085.

2. Compilers - Principles, Techniques & Tools by Aho A.V., R. Sethi & Ullmann, Addison Wesley.

Reference:

1. D.M. Dhamdhere, Compiler construction, principles and practice, MacMillan, India, 1981.
2. Introduction to Compiler Construction by Thomas W. Parsons, Computer Science Press.

MCA – 404: DISTRIBUTED COMPUTING

Hours/Week: 4   **I A Marks: 25**
   Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Principles of distributed computing: Fundamentals:- What is Distributed Computing Systems?, Distributed Computing System Models, What is DOS?, Issues in designing a DOS, Why gaining popularity in DOS?, Introduction to Distributed Computing Environment (DCE).(**chapter 1 of Text1**).

Distributed databases: - Definition, Introduction, Features Of Distributed Versus Centralized Databases, Why Distributed Databases?, Distributed Database Management Systems (DDBMSs), Reference Architecture For Distributed Databases, Types Of Data Fragmentation, Distributed database design, Objectives of the design of data distribution, Top-down and Bottom-up approaches to the design of data distribution.(**chapter 1.1, 1.2, 1.3, 3.1,3.2, 4.1 of Text 2**).

UNIT - II   - 12 Hrs

Distributed objects and remote invocation: Introduction, Communication between distributed objects, Remote procedure calls, Events and notifications. (**Chapter 5.1, 5.2, 5.3,5.4 of text 3**).

Distributed Operating System Support: Introduction, The operating system layer, Processes and threads, Communication and invocation, operating system architecture. (** Chapter 6 of text3**).

Security: Overview of security techniques, Cryptographic algorithms, Digital signatures.(**chapter7.1,7.2,7.3,7.4 of text3**).

UNIT - III   - 12 Hrs

Distributed File Systems: Introduction, File service architecture, Sun Network File System(NFS).(**chapter8.1,8.2,8.3 of text3**).

Distributed Time and clocks: Introduction, Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks.(**chapter 10.1,10.2,10.3, 10.4, 10.5 of text3**).

Coordination and Agreement: Distributed mutual exclusion algorithms, Election algorithms, multicast communication.(**Chapter 11.1,11.2,11.3,11.4 of text3**).

UNIT - IV   - 12 Hrs

Transactions and Concurrency Control: Introduction, Transactions, Nested transactions, Locks, Optimistic concurrency control, Timestamp ordering. (**chapter 12 of text3**)

Distributed transactions:- Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. **(chapter 13 of text3)**

Text Books / Reference Books:

1. Distributed Operating Systems, Concepts and design , Pradeep K. Sinha, PHI Edition

2. Distributed Databases, Principles and systems, Stefano ceri and Giuseppe Pelagatti, McGraw-Hill International editions.

3. Distributed Systems: Concepts and Design, George Coulouris, Jean Dollimore, Tim Kindberg, PHI 3rd edition.

MCA-405: ELECTIVES(E1-E6)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

MCA- 406: COMPUTER GRAPHICS AND INTERNET TECHNOLOGY LAB.
(Based on MCA-401 & MCA- 402)
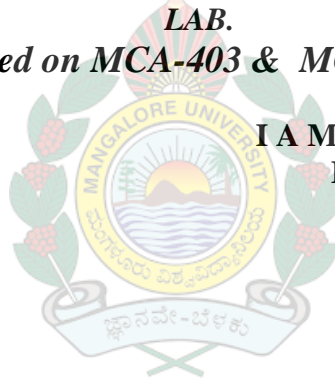
Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 50**

MCA- 407: COMPILER CONSTRUCTION AND DISTRIBUTED COMPUTING LAB.
(Based on MCA-403 & MCA- 404)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 50**

MCA-408: MINI PROJECT AND DOMAIN KNOWLEDGE SEMINAR

Hours/Week: 1   **Internal Marks: 50**

MCA-405(E1): BIOINFORMATICS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Use of computer graphics to study Bimolecular, Use of X-ray crystallography to study Biomolecular Structures, Use of NMR spectroscopy for structure determination, Nuclic acid structures, Structural features of proteins, Structural features of polysaccharides and lipids, ntroduction: Ramachandran Plot, Overview on primary, secondary, tertiary and quaternary structural elements of proteins, Covalent and Non-covalent Forces(H-bonding, base stacking & hydrophobic interaction, paired interaction, torsion angle, solvent interaction) in Protein, Role of free energy in Random and Natural states of polypeptide chain, Protein structures: Primary, Secondary, Super-secondary, Domain, tertiary, Quaternary structures and cooperativity, rotein secondary structure .

UNIT – II   -12 Hrs

prediction: Principles of secondary structure prediction, Various secondary structure prediction tools (Chou-Fasman, GOR-IV, Neural network (Overview only)), Comparisons of various secondary structure prediction tools, Structural Classification of Proteins, Protein structure classification Database, Principle of protein structure classification, Profiles and Protein Families, Coordinates, coordinate systems and transformations of coordinates, and quantities derived from coordinates, such as distances, angles, torsion angles, Protein-Protein, Protein-DNA and Protein-RNA.

UNIT – II   - 12 Hrs

Interactions, Membrane Proteins, Fibrous Proteins, Metalloproteins, Carbohydrate Binding Proteins and Metalloenzymes: Structure and Function, Protein folding, Protein Mis-folding, Diseases arising from Misfolding, The structure of spherical viruses and Introduction to protein engineering and Nucleic Acid Structures: Introduction to RNA secondary structure, DNA Tertiary structure(A- and B- DNA, Major and Minor Grooves of DNA, Z-DNA, Mechanism of specifc base sequence recognization in B-DNA, Triple helix DNA, Tetraplex DNA.

UNIT – II   - 12 Hrs

Genetics: An overview, Historical Perspective and Mendelian Analysis, Extension of Mendelian Genetics, Sex determination in plants and animals, Sex linked traits., Chromosomal and Gene mutations, Linkage and Crossing Over, Cell Mechanics, Organization of Genetic material, Gene organization and expression in mitochondria and chloroplasts, Transposable genetic elements (Jumping or mobile genes), Population and Conservation Genetics, Forward and reverse genetics and Introduction to Process of Biological Information Flow.

Text Books :

1. Address Baxevanis and Francis Ouellette, "Bioinformatics", Wiley Interscience, 2001. ISBN 0-471-38391-1.
2. Dan E. Krane and Micahel L. Raymer, *Fundamental Concepts of Bioinformatics*, Benjamin-Cummings, 2003.
3. *Genomics, Proteomics, & Bioinformatics* by Campbell and Heyer
4. *Developing Bioinformatics Computer Skills* by Gibas and Jambeck
5. *BioInformatics- sequence and Genome analysis by* David W. Mount
6. *Fundamental concepts of BioInformatics by* Dan E. Krane and Michael L. Raymes

MCA-405(E2): NETWORK PROGRAMMING

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

                                         UNIT – I   - 12 Hrs
Introduction : Introduction to Computer Networks. Understanding Network architecture. Introduction to TCP/IP Architecture, TCP/IP addressing, services, FTP, SMTP, TFTP, SNMP, Network file system, domain name system, transport layer protocols, user datagram protocol, transmission control protocol, Class addresses, ARP, RARP.

                                         UNIT – II   - 12 Hrs
Interprocess communications: File and record locking, pipes, FIFO's, stream and messages, message queues, samphorers.

                                         UNIT – III   - 12 Hrs
Sockets: Sockets system calls, reserved ports, stream pipes, socket option, asynchronous I/O, Sockets and signals. Understanding the Internet Protocols SLIP versus PPP. Understanding the Socket interface. Understanding the Windows sockets API. Understanding Raw Sockets. Understanding Internet E-Mail. Understanding the file Transfer Protocols. Understanding the Firewall. Example programs.

                                         UNIT – IV   - 12 Hrs
Transport Layer Interface: Elementary TLI functions, stream and stream pipes, asynchronous I/O multiplexing. **Remote Procedure cells:** Remote login, remote command execution, external data representation.UUCP.

Text/Reference Books:

1. A. Stevens, "TCP/IP Illustrated", Vol. 1-3, Addison Wesley, 1998
2. R. Stevens, "Unix Network Programming", PHI 1998
3. J. Martin, "TCP/IP Networking – Architecture, Administration and programming", Prentice Hall, 1994.
4. D.E. Comer, "Internetworking with TCP/IP, Vol. 1, Principles, Protocols, and architecture, PHI, 2000.
5. Internet Programming by Kris Jamsa, Galgotia publishers, 1997.

MCA-405(E3): IMAGE PROCESSING

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction:- Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image Sensing and Acquisition, Image Sampling and Quantization. **Image Enhancement in the Spatial Domain**:- Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering: Smoothing Spatial Filters, Sharpening Spatial Filters.

UNIT – II   - 12 Hrs

Image Transforms such as FT, DCT, HAAR Transform etc.**Image Enhancement in the Frequency:-** Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters.

UNIT – III   - 12 Hrs

Image Restoration: 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, Linear, Position-Invariant Degradations, Estimating the Degradation Function. **Image Compression**: Fundamentals, Image Compression Models, Error-Free Compression, Lossy Compression. **Morphological Image Processing:** Preliminaries, Dilation and Erosion, Opening and Closing The Hit-or-Miss Transformation, Some Basic Morphological Algorithms.

UNIT – IV   - 12 Hrs

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, The Use of Motion in Segmentation. **Representation and Description:** Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Relational Descriptors .

Text Books:

1. **Digital Image Processing**, R. C. Gonzalez and R. E. Woods, Prentice Hall.
2. **Digital Image Processing and Analysis**, B. Chanda, and D. Dutta Majumder, Prentice-Hall Pvt. Ltd., New Delhi, 2000

MCA-405(E4): SYSTEMS ADMINISTRATION

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction to Unix & Networking: History & Origin of Unix, Features of Unix, Unix architecture and Concepts, Popular flavors and Comparison between various flavors of Unix, Basic Commands and Introduction to Networking.

UNIT – II   - 12 Hrs

Installation: Basic hardware requirements, File system planning, OS Components, Types of Installation. *Configuration:* Configuring users, groups and peripherals, Adding softwares, mkdev, stty, inittab command in detail, Kernel rebuild. *Network Management***:** Introduction to routers, bridges, switches and hubs, Changing network configuration and files, Commands to configure network.

UNIT – III   - 12 Hrs

Security: Levels of Security, User Security, Data Security, Network Security.*Disaster Recovery:* Concepts, Importance of Backup, Backup strategy levels and devices, Commands for backup, Tools for backup. *Maintenance and Troubleshooting:* Responsibilities of a System Administrator, Troubleshooting of simulated problems.

UNIT – IV   - 12 Hrs

Performance Tuning: Importance of Tuning, Activities, Files to keep track of necessary. tuning parameters, mpstat, iostat, sar etc. *Windows NT:* Introduction, Architecture, Administration tools.

Text Books:

1. Essential System Administration   - Frisch
2. Essential Windows NT system Administration - Frisch
3. TCP/IP Network Administration   - Hunt
4. Unix in a nutshell   - Alhir
5. Unix system administration handbook   - Evi Nemeth et. Al

MCA-405(E5): ARTIFICIAL INTELLIGENCE

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT-I - 12Hrs

INTRODUCTION: Artificial Intelligence: Its scope history and applications; AI as Representation and Search - The Predicate calculus- inference rules. A logic based financial adviser; Structures and strategies for state space search – Graph theory, Strategies for search, Using state space to represent reasoning with the predicate calculus.

UNIT-II - 12Hrs

HEURISTIC SEARCH : Heuristic Search: An algorithm for Heuristic Search, Admissibility, Monotonicity and Informedness, Heuristics in games, Complexity issues. Control and Implementation of state space research - Recursion based search, Pattern directed search, Production systems, Predicate calculus and Planning, The black board architecture for Problem solving. **KNOWLEDGE BASED SYSTEMS :** Knowledge-Intensive problem solving: Overview of Expert System technology, Rule-based Expert systems, Model-based reasoning, Case-based reasoning. The knowledge Representation Problem; Reasoning with uncertain or incomplete information – The Statistical approach to uncertainty, Non-monotonic systems, Reasoning with Fuzzy sets.

UNIT-III - 12Hrs

KNOWLEDGE PRESENTATION AND LISP: Knowledge representation languages, Issues in Knowledge representation, A survey of network representation. Conceptual graphs : A Network representation language, Structured representations. Further issues in knowledge representation; Introduction to LISP – Search in LISP : A functional approach to Farmer, Wolf, Goat, and Cabbage problem. Higher order functions and procedural abstraction, Search strategies in LISP, A Recursive Unification function, Interpreters and Embedded languages. Logic programming in LISP, Streams and delayed evaluation. An expert system shell in LISP.

UNIT-IV - 12Hrs

AUTOMATED REASONING : Automated Reasoning: Weak methods in Theorem proving, The general problem solver and difference tables, Resolution Theorem proving, Further issues in Automated Reasoning; Machine Learning: Connectionist – Foundations for Connectionist Networks, Perceptions learning, Black-propagation learning, Competitive learning, Hebbian Coincidence learning, Attractor Networks or Memories. Machine Learning: Social and Emergent – modes, The Genetic algorithm, Classifier systems and Genetic programming, Artificial life and Society based learning.

Text Books:

1 G.F.Luger and W.A.Stubblefield, Artificial Intelligence – Structures and Strategies for Complex Problem Solving, Third Edition, Addison-Wesley, 1998.(Chapters 1, 2, 3, 4, 5, 6, 7, 8, 10(Except 10.5, 10.11, 10.12), 12 (Except 12.3), 14, 15)

Reference Books:

1. P.H.Winston, Artificial Intelligence, Third Edition, Addision-Wesley,1992.

2. E.Rich and Knight, Artificial Intelligence, Second Edition, Tata McGraw Hill Publishing, 1991.

3. Nils J. Nilsson, Artificial Intelligence, A New Synthesis, Morgan Kaufmann, 2000

MCA-405(E6): SOFT COMPUTING PARADIGM

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I - 12 Hrs

Introduction to Artificial Neural Network-Architecture, Activation Functions, Training Neural Net, McCulloch-Pitts Neuron model, Applications of Neural Networks.Amari's learning rule, Hebb's learning rule, DELTA rule, ADALINE, MADALINE system network, Perceptron Layer network. Associative Memory - Autoassociative, Iterative & Heteroassociative net, BAM. Self Organizing Maps- Fixed Weight Compitive Nets, Kohonen Self-Organizing Maps, Counterpropagation, Learning Vector Quantization. Radial Basis Functions and applications.

UNIT – II - 12 Hrs

Backpropagation Network – Architecture, Algorithm, Choosing parameters for a network trained by BP, Strictly local BP, Application of BP, Adaptive Resonance Theory – ART1 network, ART2 Network, Spatial Temporal Network.Special Networks – Probabilistic Networks, Cognition, Neocognition, Optical Neural Network, Holographic Neural nets.

UNIT – III - 12 Hrs

Fuzzy set theory – Fuzzy vs Crisp, Crisp sets, Fuzzy sets, Crisp Relations, Fuzzy relations, Fuzzy Systems – Crisp Logic, Predicate logic, Fuzzy Logic, Fuzzy rule based system, deffuzzification methods, Applications of Fuzzy Logic.

UNIT – IV - 12 Hrs

Genetic Algorithms – Concepts, Creation of offsprings, Working principle, Encoding, Fitness Function, Reproduction. Genetic Modelling – Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit-wise operator, Bit-wise operators used in GA, Generational cycle, Convergence of GA, Applications, Multi-level optimization.

Text Books:

1. S. Rajasekaran, G.A Vijayalakshmi Pai, " Neural Networks, Fuzzy Logic, Genetic Algorithms", Prentice Hall of India Publishers, 2003

Reference Books:

1. Rao, Vallinu B.,and Rao, Hayagriva . Neural networks and fuzzy Logic, second edition, BPB Publication
2. S.R Sivanandam, M. Paulraj, " Introduction to Artificial Neural Network", Vikas Publishers, 2005
3. Berkan C. Riza, Trubatch L, Sheldon, Fuzzy Systems design Principlea. IEEE Press , standard publishers distributers
4. Martin T. Hagan, Howard B. Demuth & Mark Beale : *Neural Network Design*, Vikas Thomson learning.
5. Simon Haykin : *Neural Networks- A Comprehensive Foundation,* Pearson Education.
2. Kishan Mehrotra, Chilukuri K. Mohan, Sanjay Ranka: *Elements of Artificial Neural Networks,* Penram International Publishing(India).
3. James A Freeman, David M. Skapura: *Neural Networks- Algorithms, Applications and Programming Techniques ,* Pearson Education.
4. Bose & Liang : *Neural Network Fundamentals,* Mc Graw Hill.
5. Linus Fe, *Neural Network in Computer Intelligence* , McGrawHill

V Semester
MCA - 501: MOBILE COMMUNICATION

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs
Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signaling.
Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.

UNIT – II   - 12 Hrs
General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes.
Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

UNIT – III   - 12 Hrs
Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML). **Third Generation (3G) Mobile Services**: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

UNIT – IV   - 12 Hrs
Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. **Global Mobile Satellite Systems**; case studies of the IRIDIUM and GLOBALSTAR systems. **Wireless Enterprise Networks**: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. PAN, HAN, WPAN.

Text Books:

1. "Wireless and Mobile Networks Architectures", by Yi-Bing Lin & Imrich Chlamtac, John Wiley & Sons, 2001.
2. "Mobile and Personal Communication systems and services", by Raj Pandya, Prentice Hall of India, 2001.
3. Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill
4. Wireless and Digital Communications; Dr. Kamilo Feher (PHI)

Reference Books:
1. "Guide to Designing and Implementing wireless LANs", by Mark Ciampa, Thomson learning, Vikas Publishing House, 2001.
2. "Wireless Web Development", Ray Rischpater, Springer Publishing, 2000.
3. "The Wireless Application Protocol", by Sandeep Singhal, Pearson Education Asia, 2000.
4. "Third Generation Mobile Telecommunication systems", by P.Stavronlakis, Springer Publishers, 2001
5. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
6. Mobile Communication Engineering – Theory & Applications; TMH.

MCA-502: ADVANCED DATABASE MANAGEMENT SYSTEMS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT-I   - 12 Hrs

Distributed Databases: Distributed database concepts; System Architecture; Distributed database design: - Fragmentation, Replication, Allocation; Types of distributed database systems: - Federated database systems, Multi-database systems; Query processing in distributed databases.

UNIT-II   - 12 Hrs

Object Relational Database Systems: Objects, Object Identity, and Reference Types, Inheritance, Features of Object-relational Systems, An Overview of the Object Features in SQL3 Object-Relational Features of Oracle 9i, Database Design for an ORDBMS, New Challenges in Implementing an ORDBMS, OODBMS, Comparing RDBMS with OODBMS and ORDBMS.

UNIT-III   - 12 Hrs

Database Security, Authorization, and Encryption, Active Database Concepts and Triggers, Temporal Database Concepts, Multimedia Databases, Spatial Databases Deductive Databases, High dimensional indexing data structures for storage and retrieval.

UNIT-IV   - 12 Hrs

Data Warehousing: Characteristics of data warehouses, Data Modelling for data warehouses, Typical functionality of a data warehouse: *XML and Internet Databases*: XML data model, XML documents and databases;*Emerging Database Technologies and Applications:* Information Retrieval and Databases, Geographic Information Systems, Genome Database Management.

Case Study : PostgreSQL / Oracle   / IBM DB2 Universal Database / Microsoft SQL Server

Text Books:

1. Raghu Ramakrishnan and Jhonnes Gehrke: Database Management Systems (Second Edition), McGrawHill 2000. (Chapters 7 to 14, 16, 21 to 27).

Reference Books:

1. Elmasri and Navathe: Fundamentals of Database Systems (Sixth Edition), Addison-Wesley, 1999.

MCA-503: DATA MINING TECHNIQUES

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT-I   - 12 Hrs

Introduction: Motivations, Data Mining Databases-Relational Data Bases, Data warehouse, Transactional Databases, Advanced Database systems and advanced Database applications. Data Mining Functionalities- Concept/Class Discrimination; characterizations and Discrimination, Association Analysis, Classification and Prediction, Cluster Analysis, Outlier Analysis and Evolution Analysis. Classifications of Data Mining Systems, Major issues in Data Mining.

Data Pre processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discrimination and Concepts Hierarchy Generation.

UNIT-II   - 12 Hrs

Mining Primitives, Languages and Systems Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Min Query Languages and Architecture of Data Ming systems.

Concept Description: Characterization and Comparison: Concept Description, Data Generalization and Summarization-based Characterization,, Analytical Characterization: Analysis of Attributes Relevance, Missing Class comparisons: Discriminating Between Different classes, Mining Descriptive Statistical Measures in Large Databases.

UNIT-III   - 12 Hrs

Mining Association Rules in Large Database: Association Rule Mining, Mining Single-Dimensional Association Rules From Transactional Databases, Mining Multi Association Rules From Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining Correlation Analysis, Constraint-Based Association Mining.

UNIT-IV   - 12 Hrs

Classification and Prediction: Definition of Classification, issues regarding classification and Prediction, Classification by decision tree induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts from association rules mining, other classification methods, prediction, classification accuracy.

Cluster Analysis: Definition of Cluster, Types of data in cluster analysis, A categorization of major cluster Methods,, Partitioning methods, Hierarchical methods, Density-Base Methods, Grid-based methods, Model based Methods, Outlier analysis.

Text Books:

1. Jaiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Morgan Kaufmann/Elsevier Science publisher, Reprint published by Harcourt (INDIA) Private Limited.

Reference Books:

1. Arun K Pujari, Data Mining Techniques, University Press (INDIA) Pvt., 2003.
2. Krzysztof J Cios; Witold Pedrycz and Roman Swiniarski, Data Mining Methods For Knowledge Discovery, Publisher: Boston : Kluwer Academic, 1998.
3. Michael Berry & Gordon Linoff, Mastering Data Mining, John Wiley & Sons, 2000.

4. Margaret Dunham, Data Mining Introductory and Advanced Topics, Prentice Hall, 2003.
5. David J. Hand, Heikki Mannila and Padhraic Smyth, Principles of Data Mining , MIT Press, Fall 2000
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer Verlag, 2001.
7. Mehmed Kantardzic, Data Mining: Concepts, Models, Methods, and Algorithms, Wiley-IEEE Press, 2002.
8. Daniel T. Larose, Discovering Knowledge in Data: An Introduction to Data Mining, John Wiley, 2004.
9. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Addison Wesley,2005.
10. Sholom M. Weiss and Nitin Indurkhya, Predictive Data Mining: A Practical Guide, Morgan Kaufmann, 1997.
11. Ian Witten and Eibe Frank, Data Mining, Practical Machine Learning Tools and Techniques with Java Implementations, Morgan Kaufman, 1999.

MCA-504: .NET TECHNOLOGIES

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT - I   - 12 Hrs

Introduction to .net: The .net framework Framework, CLR, The common type system, class library, the common language runtime, windows application, web application, web services, windows forms.

UNIT – II   - 12 Hrs

C- SHARP/C#: Language environment, c# language elements, basic concepts, c# syntax, program control predefined types, variables, operators, expressions, memory management statements, array , name spaces,inheritance,struts,indexers,delegates,preprocessors,unsafe code, the base classes.

UNIT – III   - 12 Hrs

Windows applications: VB.NET, VB.NET language, GUI designing, data access, inheritance features, interface declarations, inheritance, interface, shared members on classes, Forms, properties, methods, events, constructions, circular references, garbage collector, .net framework support, namespaces & events. ADO. NET for Windows applications- Datasets, data adapters, creating relationships between tables, data reports

UNIT - IV   - 12 Hrs

Web Applications:ASP.NET, Object model, web forms, server controls, web controls, user controls, validation controls, web from validation, cashing, data access using ADO.NET , error handling, debugging, Configuring web authorizing user & roles, accessing Database, understanding ADO.NET, using SQL data object, advanced data access, component development using c#, localization. Web services: Basic concepts: Introduction- web service protocols, describing web services, Service description language(SDL).Markup languages :HTML, XML,DHTML.XLL.

Text Book:
1. The Complete Reference ASP.NET – Matthew Mac Donald

Reference:

1. The Book of VB .NET: .NET Insight for VB Developers by Matthew MacDonald (Paperback - Feb 2002)
2. The Microsoft Office Web Components Black Book with .NET by Alvin, J. Bruney M.V.P.
3. Computing With C# and the .Net Framework By Arthur Gittleman
4. Visual Basic .NET Programming Bible, Bill Evjen, Jason Bues.
5. Visual Basic . NET programming , by Steevan Holzance

MCA-505: ELECTIVES (E1-E7)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

MCA-506: DATA MINING LAB
(Based on MCA-503)

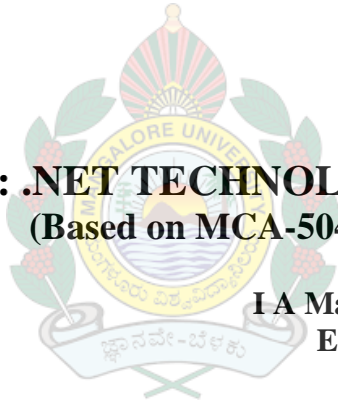**Hours/Week: 4**   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 50**

MCA-507: .NET TECHNOLOGIES LAB
(Based on MCA-504)

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 50**

MCA-508: MINI PROJECT AND DOMAIN KNOWLEDGE SEMINAR

Hours/Week: 1   **Internal Marks: 50**

MCA-505(E1): E-COMMERCE

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Module–I: IT and business, various applications of IT in business field

Module–II: History of e-commerce, definition, classification- B2B, B2C, C2C, G2C, B2G sites, e-commerce in education, financial, auction, news, entertainment sectors, Doing eCommerce., EDI and its components

UNIT – II   - 12 Hrs

Module–III : Electronic payment systems – credit cards, debit cards, smart cards, e-credit accounts, e-money, EFT, security concerns in e commerce, authenticity, privacy, S-HTP, Secure e-mail protocols, integrity, non-repudiation, encryption, secret key cryptography, public key cryptography, SET, SSL, digital signatures, firewalls.

UNIT – III   - 12 Hrs

Module–IV: Internet Marketing Phase, Marketing on the web, marketing strategies, creating web presence, advertising, customer service and support, web branding strategies, web selling models.

UNIT – IV   - 12 Hrs

Module–V: M-commerce; case study of two internationally successful e-commerce web sites and two Kerala-based e-commerce web sites; IT act (India) and e-commerce.

TEXT BOOKS:

1. E-COMMERCE BY C.S. V MURTHY, HIMALAYA PUBLISHING HOSE

REFERENCE BOOKS :

1 NIIT, Basics of Ecommerce, PHI, ISBN 81-203-2432-3, Rs 195/-
2 Erfan Turban et. al., Electronic Commerce–A Managerial Perspective, Pearson Education
3 R Kalokota, Andrew V. Winston, Electronic Commerce – a Manger's guide, Pearson Education, ISBN 81-780-8158-X.

MCA-505(E2): PATTERN RECOGNITION

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction: Machine Perception, Pattern Recognition Systems: Sensing, Segmentation and Grouping, Feature Extraction, Classification, Post Processing, The Design Cycle: Data Collection, Feature Choice, Model Choice, Training, Evaluation, Computational Complexity, Learning and Adaptation: Supervised Learning, Unsupervised Learning, Reinforcement Learning

Bayesian Decision Theory: Two-Category Classification, Minimum-Error-Rate Classification, Classifiers, Discriminants, and Decision Surfaces: The Multicategory Case, The Two-Category Case, The Normal Density, Discriminant Functions for the Normal Density, Bayes Decision Theory Discrete Features: Independent Binary Features Maximum Likelihood and Bayesian Estimation: Maximum Likelihood Estimation, The General Principle, Bayesian Estimation, Bayesian Parameter Estimation: Gaussian Case, Bayesian Parameter Estimation: General Theory, Problems of Dimensionality, Component Analysis and Discriminants: Principal Component Analysis, Fisher Linear Discriminant, Multiple Discriminant Analysis, Expectation-Maximization (EM), Hidden Markov Models, First-Order Markov Models, First-order Hidden Markov models, Hidden Markov Model Computation

UNIT – II   - 12 Hrs

Nonparametric Techniques: Introduction, Density Estimation, Parzen Windows, k_n-Nearest-Neighbor Estimation, The Nearest-Neighbor Rule, Fuzzy Classification.

UNIT – III   - 12 Hrs

Linear Discriminant Functions: Linear Discriminant Functions and Decision Surfaces, Generalized Linear Discriminant Functions, The Two-Category Linearly Separable Case, Relaxation Procedures, Minimum Squared-Error Procedures

UNIT – IV   - 12 Hrs

Unsupervised Learning and Clustering: Introduction, Mixture Densities and Identifiability, Maximum-Likelihood Estimates, Application to Normal Mixtures, k-Means Clustering, Fuzzy k-Means Clustering, Unsupervised Bayesian Learning, The Bayes Classifier, Data Description and Clustering, Criterion Functions for Clustering Hierarchical Clustering, The Nearest-Neighbor Algorithm, The Farthest-Neighbor Algorithm, Component Analysis: Principal Component Analysis (PCA), Nonlinear Component Analysis (NLCA), Independent Component Analysis (ICA) Low-Dimensional Representations and Multidimensional Scaling (MDS)

Text Books:
1.Pattern Classification (2nd ed.), R. O. Duda, P. E. Hart and D. G. Stork, John Wiley and Sons, 2001.

MCA-505(E3): PARALLEL PROCESSING AND ADVANCED COMPUTER ARCHITECTURE

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT - I   -12 Hrs

Theory of Parallelism: Introduction-Evolution of Computer Architecture, Multiprocessors and Multi computers, Shared Memory. Multi processors, Distributed – Memory Multi computers, MIMD computers. Multi vector and SIMD computers. Conditions for Parallelism – Data and Resource Dependencies, Hardware and Software Parallelism.

UNIT - II   -12 Hrs

Program Flow Mechanisms – Control Flow versus Data Flow, Comparison of Flow Mechanism. Scalability Analysis and Approaches – Evolution of Scalability computers, Merits and goals. Hardware Technologies: Instruction set Architectures, CISC, RISC, Scalar Processors, Memory Hierarchy and Virtual Memory.

UNIT - III   -12 Hrs

Back plane Bus systems, Cache Memory organizations-Cache Addressing modes, Direct Mapping and Associative Caches, Cache performance issues Linear Pipeline Processors, Instruction Pipeline ensign, Arithmetic Pipeline Design. Cache Coherence and Synchronization Mechanisms- The Cache Coherence Problem, Snoopy Bus Protocols, Hardware synchronization mechanisms.

UNIT - IV   -12 Hrs

Vector Processing Principles, Multi vector Multi processors- SIMD computer organization. Principles of Multithreading – issues and solutions, Software for Parallel Programming. Shared-Variable model, Message-Parsing Model, Data-Parallel Model, Object-oriented model, functional and Logic models Language features for Parallelism, Parallel Language Constructs.

Text Books:

1. Kai Hwang, Advanced Computer Architecture, McGraw Hill.

Reference:

1. K Hwang & Briggs F.A: Computer Architecture and Parallel Processing, McGraw Hill, 1985.

2. Moris Mano, "Computer Architecture", PHI publishers.

MCA-505(E4): EMBEDDED SYSTEMS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT – I   - 12 Hrs

Introduction to embedded systems hardware needs; typical and advanced, timing diagrams, memories (RAM, ROM, and EPROM) Tristate devices, Buses, DMA, UART and PLD's Built-ins on the microprocessor. Interrupts basics, ISR; Context saving, shared data problem. Atomic and critical section, Interrupt latency.

UNIT – II   - 12 Hrs

Survey of software architectures, Round Robin, Function queue scheduling architecture, Use of real time operating system. RTOS, Tasks, Scheduler, Shared data reentrancy, priority inversion, mutex binary semaphore and counting semaphore. Inter task communication, message queue, mailboxes and pipes, timer functions, events Interrupt routines in an RTOS environment.

UNIT – III   - 12 Hrs

Embedded system software design using an RTOS Hard real-time and soft real time system principles, Task division, need of interrupt routines, shared data. Embedded Software development tools.

UNIT – IV   - 12 Hrs

Host and target systems, cross compilers, linkers, locators for embedded systems. Getting embedded software in to the target system. Debugging techniques. Testing on host machine, Instruction set emulators, logic analyzers In-circuit emulators and monitors.

Text Books:

1. An Embedded Software Primer. David A. Simon .Pearson Education.

Reference Books:

1. Fundamentals of Embedded Software Where C and Assembly Meet. Daniel W. ewis.
   Pearson Education.
2. Embedded system: Desktop Integrations, by Oliver H. Baileg. Wordware Publishing Inc.
3. Embedded system Architecture, Tammy Noergaard Newnes

MCA-505(E5): DECISION SUPPORT SYSTEMS

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exams. Marks: 75**

UNIT-I   - **12 Hrs**

DECISION MAKING AND COPUTERISED SUPPORT : Managers and Decision Making , Managerial Decision Making and Informative System, Managers and Computerized Support, The Need for Computerized Decision Support technologies , Framework for Decision Support, The Concept of Decision Support Systems, Group Decision Support Systems , Executive Information (Support) Systems , Export Systems , Artificial Neural Networks, Hybrid Support Systems , The Evolution and Attributes of Computerized Decision Aids , Introduction and Definition Systems Models, The Modeling Process; Evaluation .

UNIT-II   - **12 Hrs**

DECISION SUPPORT SYSTEMS – I : DSS Configurations, Characteristics, Capabilities and Components of DSS, The User DSS Hardware, Distinguishing DSS from Management Science and MIS, Classification of DSS.   Data Warehousing , Access, Analysis, and Visualization, The Nature and sources of Data, Data Collection and Data Problems, The Internet and Commercial Database Services, database Management Systems in DSS, The Database Organization and Structure, Data warehousing, OLAP: Data Access and Mining, Querying and Analysis, Data visualization and Multi dimensionality, Intelligent Database and Data Mining, The Big Picture.

UNIT-III   - **12 Hrs**

DECISION SUPPORT SYSTEM –II :Modeling of MSS, Static and Dynamic Models, Treating Certainly, Uncertainty and Risk, Influence Diagram, MSS, Modeling in Spread Sheet, Decision Analysis of a few alternatives, Optimization, Heuristic Programming, Simulation, Multi dimensional Modeling, Visual Spread Sheet, Financial and Planning Modeling , Visual Modeling and Simulation , Readymade Quantitative Software Packages, Model Base Management, Knowledge- Based DSS & AI Concepts and Definitions, AI Verses Natural Intelligence, Knowledge in AI, How AI Differs From Conventional Computing , The AI Field , Types of Knowledge-Based DSS , Intelligent DSS , The Future of AI , DSS Construction; DSS Development Process ; The DSS of The Future , Decision Making in Groups , Group DSS, The Goal Of GDSS and Its Technology Levels , The Technology Of GDSS , The Decision (Electronic Meeting) Room , GDSS Software Idea Generation , Negotiation Support Systems , The GDSS Meeting Process , Constructing a GDSS and the Determinants of Its Success , GDSS Research Challenges

UNIT-IV   - **12 Hrs**

EXPERT SYSTEMS - Introduction , History , Basic Concepts , Structure of Expert Systems , The Human Element in ES , How ES Works, Problem Areas Addressed By ES , Benefits, Problems And Limitations of ES , ES Success Factors , Types of Expert Systems , ES and the Internet/Intranet/Web , Knowledge Engineering , Scope of Knowledge , Difficulties in knowledge Acquisition Methods of Knowledge Acquisition , Machine Learning , Intelligent Agents , Selecting And Appropriate Knowledge Acquisition Method , Knowledge Acquisition from Multiple Exports , Validation and

Verification of The Knowledge Base , Analyzing , coding, Documenting and Diagramming Numeric and Documented Knowledge Acquisition , ,Knowledge , Acquisition and The Internet / Intranets, Induction Table Example.

Text Books:

1. Efrain Turban and Jay E. Arson; Decision Support Systems And Intelligent Systems (Fifth – Edition) , Prentice – Hall , !988, (Chapters 1 ,2,3,4,5,6,8,10,12,13,14,15,16,21).

Reference Books:

1. Sprague R.H.Jr.,and H.J. Watson, Decision Support System (Fourth Edition), Prentice Hall , 1996 ,
2. Donald A Waterman: A Guide To expert Systems, Edition Wesley, 1985 .
3. Efrem .G. Mallach: Understanding Decision Support Systems And Expert Systems, McGraw Hill 1994.

MCA-505(E6): CRYPTOGRAPHY AND NETWORK SECURITY

Hours/Week: 4   **I A Marks: 25**
Exam Hours: 3   **Exam Marks: 75**

UNIT-I   - 12 Hrs

CRYPTOGRAPHY-I : Introduction: Attacks, Services, and Mechanisms, Security Attacks, Security, A Model of Internet work Security Services, A Model of Interwork Security. Conventional Encryption Model, Steganography, Classical Encryption Techniques. Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential and Linear Cryptanalysis. Algorithms: Triple DES, International Data Encryption Algorithm, Blowfish. Confidentiality Using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.

UNIT-II   - 12 Hrs

CRYPTOGRAPHY-II : Public –Key Cryptography: Principles of Public-Key Cryptosystems, the RSA Algorithm, Key Management, Diffie - Hellman Key Exchange. Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, Testing for Primality Euclid's Algorithm, The Chinese Remainder Theorem, Discrete Logarithms. Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Md5 Message Digest Algorithm. Digital Signatures, Authentication Protocols, Digital Signature Standard.

UNIT-III   - 12 Hrs

NETWORK SECURITY-I : Authentication Applications: Kerberos, X.509 Directory Authentication Service. Electronic Mail Security: Pretty Good Privacy, S/MIME. IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.

UNIT-IV   - 12 Hrs

NETWORK SECURITY-II

Web Security: Web Security Requirements, Secure Sockets Layer And Transport Layer Security, Secure Electronic Transaction. Intruders, Viruses, and Worms: Intruders, Viruses and Related Threats. Firewall Design Principles, Trusted Systems.

Text Books:

1. **William Stallings:** Cryptography and Network Security, Second Edition, Prentice-Hall, 1998(Chapters 1, 2, 3.1 to 3.5, 4.1 to 4.3, 5, 6, 1 to 6.4, 7, 8.1 to 8.3, 9.1, 10, 11, 12, 13, 14, 15, 16).

Reference Books:

1. **Richard E. Smith**: Internet Cryptography, Addison-Wesley 1997.
2. **Chapmaw, D and Zwicky, E**: Building Internet Firewalls, O' Reilly, 1995.
3. **Derek Atkins et al**: Internet Security, Professional Reference (second Edition), TechMedia,1997.
4. **Chris Brenton**: Mastering Network Security, Bpb, 1995.

5. **Charlie Kaufman, Radia Perlman,Mike Speciner, Network Security:** Private communication in a Public World, PTR Prentice Hall,1995.

MCA - 505(E7): DATA STORAGE TECHNOLOGY

Hours/Week : 4   **IA Marks : 25**
Exam Hours: 3   **Exam Marks : 75**

UNIT- I   -12 Hrs

Data creation and its storage, Storage location, Types of data, Evolution of data storage devices- Tape, Optical devices, Disk, Disk Arrays, DAS, NAS, SAN, CAS.

UNIT- II   -12 Hrs

Client- Server Architecture, Key requirements of storage systems, Connectivity, RAID arrays-Strips, Mirroring, Parity, Strip, RAID 0+1 vs RAID 1+0, Hot Swap. Storage hierarchy, Host environment- I/O Devices, File Systems, Volume Management, HBA's, BUS Technology – PCI, IDE/ATA, SCSI, Fiber Channel, ZBR, Disk drive performance, MTBF.

UNIT- III   -12 Hrs

Intelligent and Storage systems, Disk cache, hits and misses – Algorithms used, write cache hit, read cache hit, detailed analysis storage elements – DAS, NAS, FCSAN, IPSAN, CAS, NAS File service protocols, Evolution of Fiber channel SAN – Connectivity, Port, Fiber Channel Addressing, ISLS, Zoning, LVN masking, IPSAN, iFCP, iSCSI.

UNIT- IV   -12 Hrs

Business continuity, Disaster recovery- Disaster Restart, RTO- Recovery Time Objective, Single points of failures, Local Replication – Remote Replication, Synchronous and Asynchronous Replication, Backup and Restore, Backup Granularities and levels, SAN/ LAN mixed based backups, volume groups and logical volumes, LVM, DWDM, SONNET, SRDF, Monitoring the data center – SAN, end-to-end monitoring, Information Life Cycle.

-12 hrs

Text Books:

1. Essentials a complete guide to understanding and implementing SAN's, Richard Baker & Paul Masiglie, Wiley

Reference Books:

1. Storage Security, John Chirillo & Scott Blaul, Wiley
2. IP SAN's: An Introduction to iSCSI, iFCP and FCIP protocols for SAN, Thomas Clark, Addison-Wesley Professional
3. Essential guide to SAN and Essential guide to Computer data storage package, John R Vacca & Anderi Khurshudov, Prentice Hall Ptr.