MOHANLAL SUKHADIA UNIVERSITY UDAIPUR

Master of Science (Computer Science)

1. **Duration of the Course :** The M.Sc.(CS) course will be of four semesters duration. Each semester will be approximately 4 months duration.

2. **Medium of Instruction :** The medium of instruction and examination shall be English.

3. **Eligibility :** The candidate must posses graduate (10+2+3) degree or equivalent from any recognized university with at least 50% marks in aggregate (45% in case of SC/ST and OBC candidates) having computer science/Information Technology as one of the subjects.

4. **Courses of Study and Examination**

I Semester

Paper	Paper Name	Duration of exam. (hours)	Max. Marks		Total
			University Exam.	Internal Assessment	
Paper-I (MCS-101/CS-12)	Algorithms	3	75	25	100
Paper-II (MCS-102/CS-11)	Operating System	3	75	25	100
Paper-III (MCS-103/CS-14)	Computer Networks	3	75	25	100
Paper-IV (MCS-104/CS-04)	Discrete Mathematics	3	75	25	100
Paper-V (MCS-105/CS-07)	Object Oriented Programming using C++	3	75	25	100
Paper-VI (MCS-106)	Practical-I OOPs Lab.	6	75	25	100
Paper-VII (MCS-107)	Practical-II Algorithm and O.S. Lab.	6	75	25	100
Paper –VIII (MCS-108)	Communication Skill	6	75	25	100
Paper VIII (MCS-108)	TOTAL		600	200	800

II Semester

Paper	Paper Name	Duration of exam. (hours)	Max. Marks		Total
			University Exam.	Internal Assesment	
Paper-I (MCS-201/CS-18)	Computer Graphics	3	75	25	100
Paper-II (MCS-202/CS-15)	Compiler Design	3	75	25	100
Paper-III (MCS-203)	Microprocessor based Systems	3	75	25	100
Paper-IV (MCS-204/CS-17)	Network Management and Information Security	3	75	25	100
Paper-V (MCS-205/CS-13)	Object Oriented Programming using Java	3	75	25	100

Paper-VI (MCS-206)	Practical-I Computer Graphics Lab.	6	75	25	100
Paper-VII (MCS-207)	Practical-II Java Lab.	6	75	25	100
	TOTAL		525	175	700

III Semester

Paper	Paper Name	Duration of exam.	Max. Marks		Total
			University Exam.	Internal Assessment	
1	2	3	4	5	6
Paper-I (MCS-301/CS-20)	Software Engineering	3	75	25	100
Paper-II (MCS-302/CS-21)	Modeling and Simulation	3	75	25	100
Paper-III MCS-331/CS-22 MCS-332/CS-23	Elective-1 (i) Parallel Processing (ii) Bio-Informatics	3	75	25	100
Paper-IV MCS-341/CS-24 MCS-342/CS-25	Elective –2 (i) Artificial Intelligence (ii) Advanced Java Programming	3	75	25	100
Paper-V MCS-351/CS-26 MCS-352/CS-27	Elective –3 (iii) Embedded System Design (iv) Image Analysis and Computer Vision	3	75	25	100
Paper-VI (MCS-306)	Practical-I: Minor Project.	6	75	25	100
Paper-VII (MCS-307)	Practical-II Elective Lab.	6	75	25	100
	TOTAL		525	175	700

IV Semester

Paper	Paper Name/ Alternative Code	Duration of exam. (hours)	Max. Marks		Total
			University Exam.	Internal Assessment	
Paper-I (MCS-401)	Project Work		Grade*	100	100
			Grand Total		2300

*Excellent/Very Good/Good/Satisfactory/Unsatisfactory

Scheme of Instruction:

Each semester will be of four months (80 working days) duration. Details of lecture hours per week are as follows:

Theory: 3 hrs/week for each paper

Practical: Students are required to work in the laboratory for 24 hrs/week carrying out practical assignments & projects as per instruction of the teachers. The practical work will be carried out under the supervision of lab tutors. In the first semester, students are required to undergo additional practical training of 10hrs/week in the Communication Skill

Professional/Industrial Training: 40 hrs/semester professional training to the students by software professionals from industry.

Project Guidelines

Only the projects submitted by the candidates as per following guidelines will be evaluated.

1. Project to be selected by the student at the end of third semester
2. The project must be of approximately 480 man hours and so certified by the supervisor of the project
3. Progress report must be submitted through supervisor
4. Project must be submitted before the prescribed last date .
5. Candidates are required to make a presentation of their project work during their project examination
6. Students whose projects graded as unsatisfactory will given one more chance to undertake another project under another supervisor /organization.
7. The project work of the candidates whose progress report is not submitted will be considered as incomplete may be terminated within two weeks from the prescribed due date.
8. Students will be allowed to undertake project works only at the bonafide organizations.
9. Examination of the project work will be conducted by a committee consisting of one internal examiner and one external examiner.

Examination Scheme:

1 University shall conduct examinations only after completion of at least 80 working days of instruction in each semester. External examination will be conducted on consecutive working days without any gap.

2 Each theory paper shall be of 100 marks (75 marks for written examination of 3-hrs duration and 25 marks for internal assessment

3 Each practical/Project paper shall be of 100 marks (75 marks for semester practical examination of six hours duration and 25 marks for internal assessment.

4 Students are required to answer total five questions out of eight questions in each theory paper in the external examination

5 A committee consisting of Program co-coordinator/Head of the Dept., Teacher concerned and One advisory committee member/Head of the University Department concerned (for courses offered at affiliated colleges) will award internal marks. The committee will ensure that norms given below are followed in the award of internal marks for each theory & Practical paper and detailed breakup of internal marks as per rules must be sent to university.

6. Detailed outline of the course and a list of textbooks and reference books followed to teach the course will be intimated to the examiner along with a model paper to provide necessary guide lines to set question paper for the external examination.

7. In case of questions in the external examination is found outside the prescribed syllabus or not within the scope of the syllabus, the matter will be referred to the advisory board. The advisory committee will examine the matter in detail and will make specific recommendation to the University Grievance committee. If the students walk out or boycott the examination, they will be declared failed in that paper/examination and their grievance will not be examined by the board of examiners.

8. Internal Evaluation Scheme to award internal marks

Assignments: 40% of the internal assessment marks for each theory paper will be awarded on the basis of the performance in the assignments regularly given to the students.

Internal examination: 40% of the total internal assessment marks for each theory paper will be awarded on the basis of the performance in the written examination conducted by the faculty, one at the end of the two months and another at the end of the semester.

Seminar & Oral examination: 20% of the total internal assessment marks for each paper will be awarded on the basis of the performance in a seminar and Internal viva examination. At least one Internal Viva Voice examination per paper will be conducted by a committee consisting local examiners preferably during internal examination

Internal marks in each paper along with details of marks awarded under assignments, Two internal examinations, Seminar and oral examination along with number of classes

attended by the student in each paper must be submitted in a tabular column to the university

Note: Candidate who attends less than seventy percent of the total classes conducted in a paper will be awarded zero marks in the internal marks of that paper.

Students are required to keep record of the assignments, Seminars and answer books of the internal examinations and present them at the end of the semester to the advisory board of the course. The attendance / Lab log book and performance sheet of each student will be examined by the board .The internal marks awarded by the teacher will be moderated by the advisory board if necessary.

If a student has undertaken project work but failed to submit Project report before the prescribed date for submission, he/she shall be declared failed in IV semester. However he/she will be allowed to submit the same whenever next Semester examination is conducted and internal marks will be carried over.

If the project work of a student is found unsatisfactory or he/she is not carried out the project work he or she will be declared Failed in the IV th Semester examination and shall not be eligible for award of M.Sc. degree. Such students will be given one more chance within one year provided they undertake a fresh project work as per rules. Internal marks if any awarded shall be treated as cancelled and student is required to undergo fresh internal examination as per rules

Vacation/holidays: Normal holidays except national holidays and vacations declared by the University for Traditional Courses will not be applicable to this course due to professional and semester nature of the course. If required, classes may be conducted even on Sundays.

Minimum passing marks and classification of the successful candidates:

A: First Semester

1. (a) The minimum marks for passing Ist semester shall be 40% in each paper and 50% marks in the aggregate.

   (b) A candidate may be promoted to second semester if he or she has secured at least 40% marks in each papers but has failed to secure 50% marks in aggregate. He/she shall be required appear in some of the papers when these papers are offered again by the university so as to satisfy the passing criteria laid in 1 (a). However, candidate will not be allowed to reappear in the practical papers to improve the percentage.

(c) A candidate may be promoted to the second semester if he/she has secured at least 40% marks in any six papers prescribed in the first semester, provided that aggregate of marks in all papers together is at least 50%. Such candidate shall be required to appear in papers in which he/she has secured less than 40% marks when these courses are offered again so as to satisfy the passing criteria laid in 1 (a)

(d) A candidate fails to satisfy the criteria 1 (a), 1 (b), and 1 (c) for promotion to 2nd semester shall be required to rejoin the course in the first semester, if otherwise eligible in accordance with the university regulations laid in this regard.

(e) In case result of the first semester is not declared by the university, before the starting of the second semester, all the students who have appeared in all the papers in the first semester will be allowed to attend the class of the second semester at their own risk. Candidates who are not eligible to be promoted to the second semester will have to leave the semester.

2: Second Semester

(a) The minimum marks for passing 2nd semester shall be 40% in each paper and 50% marks in the aggregate.

(b) A candidate may be promoted to third semester if he or she has secured at least 40% marks in each papers but has failed to secure 50% marks in aggregate. He/she shall be required appear in some of the papers when these papers are offered again by the university so as to satisfy the passing criteria laid in 2 (a). However, candidate will not be allowed to reappear in the practical papers to improve the percentage.

(c) A candidate may be promoted to the third semester if he/she has secured at least 40% marks in any five papers prescribed in the second semester, provided that aggregate of marks in all papers together is at least 50%. Such candidate shall be required to appear in papers in which he/she has secured less than 40% marks when these courses are offered again so as to satisfy the passing criteria laid in 1 (a)

(d) A candidate fails to satisfy the criteria 2 (a), 2 (b), and 2 (c) for promotion to 3rd semester shall be required to rejoin the course in the second semester, if otherwise eligible in accordance with the university regulations laid in this regard.

(e) In case result of the second semester is not declared by the university, before the starting the third semester, all the students who have appeared in all the papers in the second semester will be allowed to attend the class of the third semester at their own risk. Candidates who are not eligible to be promoted to the third semester will have to leave the semester.

3: Third Semester:

(a)The minimum marks for passing 3rd semester shall be 40% in each paper and 50% marks in the aggregate.

(b) A candidate who has secured at least 40% marks in each papers but has failed to secure 50% marks in aggregate shall be required appear in some of the papers when these papers are offered again by the university so as to satisfy the passing criteria laid in 3 (a). However, candidate will not be allowed to reappear in the practical paper to improve the percentage.

(c) A candidate may be promoted to the fourth semester if he/she has secured at least 40% marks in any five papers prescribed in the third semester, provided that aggregate of marks in all papers together is at least 50%. Such candidate shall be required to appear in papers in which he/she has secured less than 40% marks when these courses are offered again so as to satisfy the passing criteria laid in 3 (a)

(d) A candidate fails to satisfy the criteria 3(a),3(b) and 3(c) shall be required to rejoin the course in the third semester, if otherwise eligible in accordance with the university regulations laid in this regard.

(e)In case result of the third semester is not declared by the university, before the starting the fourth semester, all the students who have appeared in all the papers in the third semester will be allowed to attend the class of the fourth semester at their own risk. Candidates who are not eligible to be promoted to the fourth semester will have to leave the semester.

(4) Fourth Semester

Project

1. Project in the semester IV examination shall carry 100 marks for internal assessment and following grading system will be followed in the external examination conducted by the University. Excellent / Very Good/Good / Satisfactory / Unsatisfactory.

2. The minimum marks for passing 4^{th} semester shall be 50% in the Internal assessment part of the Project work and Excellent/very good/Good/Satisfactory grading in the external examination of the Project

3. A candidate who has failed in the Internal examination of the project shall not be eligible for external evaluation of the project. Such candidates shall be required to do project work again. Candidates who have been awarded unsatisfactory grading in the project will be given one more chance to do another project work.

RESULT

At the end of final examination the candidate's eligible for the award of M.Sc. Degree in Computer Science with specialization in the subject he/she had chosen in the III rd Semester. The Specialization subject will be mentioned in the mark sheets . Degree shall be classified on the basis of the marks obtained in the first, second, third and fourth semester examination taken together, as follows:

(a) First Division with distinction:

75% or more marks in the aggregate and provided the candidate has passed all the papers and examination in the first attempt.

(b) First Division

60% or more marks but fails to satisfy criteria being classified as first division with distinction laid in (a)

(c) Second Division
All other than those included in (a) and (b) above

The Specialization of the Course will be marked in the Degree as well as in the mark sheet to emphasize the area of specialization. A candidate must pass the M Sc examination within three years of the initial admission to the first semester of the course

Note: Since M.Sc. (Computer Science) is a Professional course, all other examination rules will be that applicable to professional PG courses of the University

Syllabus

FIRST SEMESTER

Paper – I (MCS 101/CS-12) :Algorithms

Algorithms and structured programming, analysing algorithms, asymptotic behaviour of an algorithm, Order notations, time and space complexities (polynomial, logrithmic and exponential), average and worst case analysis, lower and upper bounds.

Algorithm design strategies : Divide and conquer (Mergesort, Quicksort, matrix multiplication).
Greedy method (knapsack problem, jobsequencing with deadlines, minimum spanning trees).
Dynamic programming (0/1 knapsack, travelling salesman problem).
Basic search & Traversal Techniques (Breadth first and Depth first traversals of Graphs).

Backtracking (8 - queen problem, sum of subsets, Graph colouring, 0/1 Knapsack).
Branch & Bound (0/1 knapsack, Travelling salesman).

Data structures for set manipulations problems : Fundamental operation on sets, a simple disjoint-set union algorithms, tree structures for UNION-FIND problem, applications and extensions of the UNION-FIND algorithm

Algorithms on Graphs : Minimum cost spanning trees, deoth-first search, bi-connectivity, strong connectivity, path finding problem, transitive closure algorithm

Matrix algorithms : Basics, Strassen's matrix-multiplication algorithm, inversion of matrices

Pattern Matching algorithms : Finite automata and regular expression, recognition of regular expression, patterns, recognition of substrings

Problem classes P, NP, NP-hard and NP-complete, Approximation algorithms for some NP-complete problems, lower bounds on algebric decision trees.

Text/Reference Books :

1. Fundamentals of Computer Algorithms, E. Horowitz, S. Sahni, Galgotia Publications, 1985.
2. Design & Analysis of Computer Algorithms, Av. Aho, J.E. Hopcroft, & J.D. Ullman, Addition Wesley, 1974.
3. Algorithms - The Construction, Proof & Analysis of Programs, P.Berlions & P. Bizard, John Wiley & Sons, 1986.
4. Data Strucures and Algorithms, Vol. I & II, K. Melhorn, Springer Verlag, 1984.

Paper-II (MCS-102/CS-11): Operating systems

Operating system as resource Manager: Overview of processor management, memory management, file management, Device management; operating system services;
operating system classifications-single user, multiuser, simple monitor, batch processing, time sharing, real time operating system.

Processor management: Process overview, process states, multiprogramming, levels of schedulers and scheduling algorithms, multi-processor scheduling, deadlock prevention, avoidance detection and recovery.

Memory management: Partition, paging and segmentation; types of memory management schemes, virtual memory-demand paging, procedure sharing, run time storage allocation.

File Management: File supports, access methods, allocation methods- continuous, linked and index allocation; directory systems-single level, tree structured, acyclic graph and general graph directory, file protection, layered file system.

Resource Protection: Mechanism, policy and domain of protection, access matrix and its implementation, dynamic protection structure.

Device Management: Dedicated, shared and virtual devices, sequential access and direct access devices , channel and control units, I/O buffering, I/O schedulers, spooling system.

Concurrent Process and Programming: Precedence graph, Berntein condition, process hierarchy, process synchronization-critical section and mutual exclusion, classical process co-ordination problems, critical region, monitors, concurrent languages.

Recommended Books :

1. G. Silberschatz: Operating System Concepts, John Wiley.
2. H.M. Deitel : An Introduction to Operating System.
3. Hansen : Operating Systems Principles.
4. Shaw : Logical Design of Operating System.
5. Haberman : Introducion to Operating System Design.

Paper-III (MCS-103/CS-14):Computer Networks

Data Communication : Theoretical model of Communication; Analog and Digital signal; Fourier analysis, bandwidth, channel, baudrate of transmission; Modulation and demodulation; Multiplexing-FDM, TDM; Transmission medium;Transmission error-Error detection and correction; Transmission line coupling; synchronous and asynchronous transmission.

Networks : Network goal and applications; Network structure; Network architecture-protocol Hierarchies, ISO REF model, DOP protocol architecture, some well known networks in the light of ISO model.

Switching Mechanism: Terminal handling; Multiplexing and concentration; Data link control protocols-Stop and wait protocol; sliding window, HDLC,SDLC, BISYNC protocol; Data link layer of some well known networks; Network control protocol-virtual circuit service, datagram service, routing algorithms, congestion, deadlock; Network control protocol of well known network; satellite and packet radio network; Local area Network; Network security and privacy; Text compression techniques; virtual terminal protocol; Transport and session services; Interconnection of packet switched networks.

Recommended Books :

1. A. S. Tanenbaum : Computer Networks
2. James Martin : Computer Networks and Distributed Processing
3. William Stailings : Local Networks - An Introduction.

Paper-IV (MCS-104/CS-04) :Discrete Mathematics

Set Theory: Introduction, sets and elements, universal set and empty set, subsets, venn diagram, set operations, algebra of sets and duality, finite sets, counting principle, classes of sets, power sets, partitions, mathematical induction.

Relations: Introduction, product set, relations, pictorial representation of relations, composition of relations, types of relations, closure properties, equivalence relations, partial ordering relations, n-ary relations.

Functions: One-to-one onto and invertible functions, mathematical functions, exponential and logarithmic functions, sequences, indexed classes of sets, recusively defined functions, cardinality.

Logic and Propositional calculus: Propositions and compound propositions, basic logical operations, propositions and truth tables, tautologies and contradictions, logical equivalence, algebra of proposition, conditional and biconditional statements, arguments, logical implication, propositional functions, quantifiers, negation of quantified statements.

Matrices: Matrix addition and scalar multiplication, matrix multiplication, transpose, square matrices, invertible matrices, inverse, determinants, elementary row operations, Gaussian elimination, boolean matrices.

Counting: Basic counting principles, factorial notation, binomial coefficient, permutations, combinations, the pigeon-hole principle, the inclusion-exclusion principle, ordered and unordered partition.

Probability Theory: Introduction, Sample space and events, finite probability space, conditional probability, independent events, independent repeated trials, binomial distribution, random variables.

Property of Integers: Order and inequalities, absolute value, mathematical induction, division algorithm, divisibility, primes, greatest common divisor, Euclidean algorithm, fundamental theorem of arithmetic, congruence relation, congruence equations.

Recommended Books :

1. Lipschutz S., Lipson M. :Discrete Mathematics
2. Kolman B.,Robert C.B., Sharon R.: Discrete Mathematical Structures
3. Trembley J.P. and Manohar R.P. : Discrete Mathematical Structures with Applications to Computer Science.
4. Lew : Computer Science : A mathematical introduction

Paper-IV(MCS-105/CS-07):Object Oriented Programming using C++

Definition : Object Oriented Programming, Paradigms and Metaphors, Active data; Message passing; classes , Installation and Inheritance; Type of Object oriented Systems.

Object-Oriented Programming Tools: Development of programming Language C++, Declarations and constants; expressions and statements; Functions; classes; operator overloading, derived classes, Files and stresses, string Manipulation , buffering.

Concurrent Object Oriented systems.

Applications: Object Oriented Programming in Simulation and A.I.; programming Environments.

Recommended Books:

1. L.Pinson and R.Wiener, An Introduction to O.O.P and Siveltalk- Addison Wesley.
2. E.R.Tello, Object Oriented Programming for A.I. –AddisonWesley.
3. P.M.Chirlian,, Programming in C++, Merril Pub.Co.
4. Stroustrap, B: The C++ programming Language- Addison Wesley.

Paper-VI (MCS - 106)
Practical-I OOPs Lab
Experiments based on Paper MCS-105.

Paper-VII (MCS - 107)
Practical-II Algorithm and OS Lab
Experiments based on Papers MCS-101 and MCS-102.

SECOND SEMESTER

Paper –I (MCS-201/CS-18):Computer Graphics

Geometry and Line generation: Lines, line segments and perpendicular lines, distance between a point and a line, vectors, pixels and frame buffers, vector generation, Bresenham's algorithm, antialiasing of line, thick line segments, character generation, displaying the frame buffer.

Graphics Primitives : Display devices, primitive operations, The display-file Interpreter, Normalized device co-ordinates, Display file structure and display-file algorithms, display control, text, the line style primitive.

Polygons : Polygon representation, Entering polygons, polygon interfacing algorithms, filling polygons, filling with a pattern, initialization, anialiasing.

Transformations : Matrices, scaling transformations, Rotation, Homogenous co-ordinates and Translations, coordinate transformations, rotation about an arbitrary point, inverse transformations, transformation routines, transformation and patterns initialization and display procedures.

Segments : Creation of segment, closing, deletion and renaming segments, visibility, image transformations, saving and showing segments.

Windowing and clipping : The viewing transformation and its implementation, clipping, the Cohen-Sutherland Outcode algorithm, The Sutherland-Hodgman algorithm, clipping of polygons, Generalized clipping, multiple windowing.

Three Dimensions : 3D geometry, 3D primitives and transformations, Parallel projection, Viewing projections and special projections, conversion to view plane co-ordinates, clipping in three dimensions, clipping planes.

Hidden surfaces and Lines: Back-face algorithm, Z-buffers, Scanline algorithm, Franklin algorithm.

Illumination, Reflection, shadows, Ray tracing, halftones.

Recommended Books :

1.Steven Harrington : Computer Graphics : A programming Approach.

Paper-II (MCS-202/CS-15):Compiler Design

Introduction : Analysis of source programme, Different phases of a compiler, Symbol Table.

Lexical Analysis : Different approaches to design a lexical analyzer, regular expression, finite automata (Deterministic & Non-deterministic). RE to NFA and NFA to DFA. Optimization of DFA states. Implementation of lexical analyzer.

Error Handling : errors in different phases of compiler. Introduction to Compiler Construction Tools.

Syntax analysis : context free grammer, Parsing techniques (Top-down, Bottom-up, Operator-precedence, SLR, LALR).

Intermediate code generation : Intermediate language, syntax directed translation, assignment statement, boolean statements and backpatching, array references, procedure calls and record structure.

Code optimization : Principal sources of optimization, Local & Loop optimization, loop invarient computations, induction variable elimination.

Code generation : Design of code generation, a machine model, a simple code generator, register allocation & assignment, code generation from DAG's.

Text/Reference Books :

1. Principles of Compiler Design by Aho, Ullman; Narosa Publishing House, 1989
2. Compilers : Principles, techniques and tools by Aho, Sethi, Ullman; Wesley 1988
3. Compiler Construction : Theory & Practice by Barrat, Eates, Cought, Galgotia 1988
4. Compiler Writing by Trembly, Sorenson ; Mc-Graw Hill Book Co.
5. Compiler Construction for Digital Computer by Gries; John Willey & Sons, New York - 1987

Paper-III (MCS-203):Microprocessor based Systems

Introduction : Microcomputers, Microprocessors, Bus structure of Microprocessor System.

Microprocessor Architecture and Microcomputer systems : Microprocessor architecture & operation with example of 8085 Microprocessor, architecture, timing and sequencing, memory, I/O Memory and I/O synchronization, memory speed requirements, interfacing devices, logic levels, loading and buffering.

8085/8080 - A Based Microcomputer systems: 8085 Microprocessor, Bus timings, Demultiplexing the Bus (AD7-AD8), Generating control signals, 8080 - A Microprocessor, Instructions and timing, instructions (8 bit & 16 bit), Data transfer operations, arithmetic operations, logic operations, Branch operations, counter & timing delays, stack & subroutines.

Interfacing peripherals, I/O, Memory and Applications: Interfacing output display, input keyboard, memory, memory mapped I/O, Interrupts and DMA : 8085/8080 - A interrupts structure types and masking, priority interrupt structure, real time clock and internal times, consideration for using interrupts, DMA & 8257 DMA controller. Programmable interface devices. Programmable peripheral devices. Parallel communication, 8255 Programmable Peripheral Interface, Serial Communication, RS-232-C interface, Data communication with TTY using SOD & SID lines.

Software model of the 8086/8088 microprocessor, Memory address space & data organisation, Segment registers & Memory segmentation, Dedicated & general use of

memory, Instruction pointer, Data registers, Status register, Generating a memory address, stack, I/O address space, Addressing modes of 8088. The 8086/8088 instruction set, Data transfer instructions, Arithmetic instructions, Logical instruction, Shift instructions, Rotate instructions, Flag control instructions, Compare instruction, Jump instructions, Subroutine & the subroutine handling instructions. Loop & loop handling instructions.

Text/Reference Books:

1. Microprocessor architechture, Programming & applications with the 8085/8080-A, R.S. Gaonker; Wiley Eastern Limited ISBN 085226, 2973, 1988.
2. Microprocessor and Programmed Logic, K.L. Short; Prentice Hall of India Pvt. Ltd. 1988. 2nd edition ISBN-0-87692-515-8.
3. Microprocessor and Interfacing, Douglas V. Hall, Mc-Graw Hill Book Company, 1987 ISBN-0-07-100462-9.

Paper- IV (MCS-204):Network Management and Information Security

Network Management: Management Standards and Models, configuration management, configuration database and reports, fault management, identification and isolation, protecting sensitive information, host and user authentication, structure of management information, Standard management information base, SNPv1 protocol, acounting management, performance management, network usage, matrics and quotas.

Cryptography: Plain text, cipher text, encryption algorithm, decryption algorithm, requirements for cryptography, coventional symetric encription algorithms, symetrics vs asymetric, block and stream ciphers, DES, double and triple DES, cryptographic models, key distribution, link encryption, end-end encryption, steganography.

Public Key Infrastructure and Message Authentication: Public key cryptography principles and algorithms, RSA, Diffe-Hellman key exchange, DSS, eliptic curve. One way hash functions, message digest, MD5, SHA1. Digital signatures, public key infrastructure, digital certificates, certificate authorities.

Network security: Overview of IPV4: OSI model, maximum transfer unit, IP, TCP, UDP, ICMP, ARP, RARP and DNS, ping, traceroute. Network attacks: Buffer overflow, IP scheduling, TCP session hijacking, sequence guessing. Network scanning: ICMP, TCP sweeps, basic port scans. Denial of service attacks: SYN flood, teardrop attacks, land, smurf attacks. Visual and private network topology: tunneling, IPSEC. Traffic protocols: authentication headers, ESP internet key exchange, security association PPTP, L2TP.

Web Security and Application Security: Web servers and browsers: security features, server privilages, active pages, scripting, security configuration setting for browsers, security of active content: JAVA, JAVA script, Active x, plug-ins, cookies. SSL & SET, security mail: PEM and PGP.

Firewalls and Instruction Detection Systems: Firewall characteristics & design principles, types of firewalls, packet filtering router, application level gateway or proxy, content filters, bastion host. Firewall architectures: dual homed host, screening router, screened host, screened suvnet. Firewall logs anmd instruction detection system: component of an IDS, placement of IDS components, types of IDS: network based IDS, file integrity checkers, host based IDS, IDS evaluation parameters.

Recommended Books:

1. William Stallings: Network Security Essentials, Pearson Education Asia.
2. Gollman Dieter: Computer Security: John Wiley & Sons Ltd.

Paper-V (MCS-205):Object Oriented Programming using Java

Introduction to Java: Bytecode, features of Java, data types, variables and arrays, operators, control statements.

Inheritance: Basics, using super, method overriding, using abstract classes, using final with inheritance.

Packages and Interfaces: Defining a package, importing package, defining an interface, implementing and applying interfaces.

Exception Handling: Fundamentals, exception types, using try and cache.

Multithreaded Programming: Creating a single and multiple threads, thread priorities, synchronization.

Applets: Applets basics, applets architecture, applets skeleton, the html applet tag, passing parameters in applets.

Event Handling: Event classes and event listener interfaces.

Introduction to swings.

Recommended Book:

1. P. Naughton and H. Schildt: The complete reference to Java, Tata Mc-Graw Hill.

Paper-VI (MCS - 206)
Practical-I Computer Graphics Lab
Experiments based on Paper MCS-201.

Paper-VII (MCS - 207)
Practical-II Java Lab
Experiments based on Paper MCS-205.

THIRD SEMESTER

Paper -I(MCS-301):Software Engineering

Software Engineering Fundamentals: Definition of software product and process, software development paradigms, software lifecycle models: Waterfall model, prototyping model, spiral model, incremental model, concurrent development model.

Software Requirement Analysis and Specification: System specification, software requirement specification (SRS) standards, format specification methods, specification tools, requirements validation and management.

Software Process and Design: Software process and models, tools and techniques of process modeling, product and process. Software architecture, modular design- cohesion and coupling, process-oriented design, data-oriented design, user-interface design, real-time software design.

CASE Tools: Relevance of CASE tools, high-end and low-end CASE tools, automated support for data dictionaries, DFD, ER diagrams.

Coding and Testing: Choice of programming languages, coding standards, introduction to testing process, functional & structural testing, testing activities like unit, integration & system testing, testing tools and workbenches.

Configuration Management: Concepts in configuration management, the configuration management process: Planning and setting up configuration management, perform configuration control, status monitoring and adults.

Software Maintenance: What is software maintenance, maintenance process & models, reverse engineering, software re-engineering, configuration management issues and concept, configuration planning & techniques, software versions and change control process, documentation. Software Quality and Metrics: Software quality assurance, debugging and reliability analysis, program complexity analysis, software quality and metrics.

Object-oriented SW Engineering: OO concepts and approach, OO analysis, domain analysis, OOA process and object models, OO design, system design process and models, design patterns, quality assurance and metrics, testing and verification of OO programs.

Suggested Books:

1. R. Pressman: Software Engineering, McGraw-Hill.
2. K.K. Agrawal and Y. Sing: Software Enginnering, New Age International.
3. P. Jalote: Software Project Management in Practice, Pearson.

Paper-II (MCS-302):Modeling and Simulation

Definition of System: Types of system-continuous and discrete , modeling process and definition of a model, computer work load and preparation of its models, verification and validation modeling procedures, comparing model data with real system, differential and partial differential equation models, combining discrete event and continuos models (Example of a computer system should be used for illustration and discussion purpose).

Simulation Process: Use of simulation, discrete and continuous simulation procedures and simulation of a time sharing computer system.

Simulation languages: A brief introduction to important discrete and continuous simulation language; Study and use of one language (depending on the availability) in details.

Recommended Books:

1. Payer, T.A: Introduction to simulation, McGRaw Hill
2. Spriet, W.A : Computer Aided Modelling and Simulation- Academic Press
3. Barnes,B: Modelling and performance Measurement of Computer systems
4. Gorden G: System simulation ,Printice Hall

Paper III (1) (MCS-331):Parallel Processing

Introduction to parallel processing: Parallel architectures; systolic; wafer scales associative;array; dataflow.

Communications: Problem decomposition;systolic array;crossbarring network;multistage network;dynamic communication.

Parallel algorithms: sorting, searching dictionary operations; FFT;matrix operations; Graph algorithms; numerical algorithms; transputer; software; OCCAM.

Recommended Books:

1. Michael J Quinn: Desining efficient algorithms for parallel Computers-McGRaw Hill

2. Selim G Akl: The design and analysis of parallel algorithms-Printice-Hall

Paper III (2) (MCS-332):Bio-Informatics

Introduction to computational biology and bioinformatics: Computational biology, bioinformatics , Basic molecular biology, Understanding DNA, RNA and Protein, Genomes, genes, genomics, genetics, and proteomics, protein structures and functions , representation of molecular and protein structures, modelling of biochemcal systems, Major computational methods and computing in bioinformatics Computational environment of bioinformatics: High performance computing system, Web and Internet distributed systems.

Databases for bioinformatics: NIH Gene Banks and other genrome data banks, Commonly used software in genomic analysis, Interfaces for Bioinformatics programs SeqWeb: a Web interface to GCG, SeqLab: an X-Windows interface to GCG , Integration of GCG with other UNIX programs, scripts, etc.Other Web-based Bioinformatics platforms (free and commercial)

Computing in Bioinformatics:

Sequences: Sequence analysis: Alignment via dynamic programming, multiple sequence alignments and consensus patterns, scoring schemes and matching statistics, Secondary Structure, TM-helices

Stucture: Basic Protein Geometry and Least-Squares Fitting, Calculation of Volume and Surface ,Structural Alignment , Molecular Dynamics & Monte Carlo Methods

Database: Protein Domains and Modules Clustering and Trees Large-scale Censuses and Genome Comparisons

Suggested Books:

1. B. Bergeron: Bioinformatics Computing, Pearson Education.
2. D.E. Krane and M.L. Paymer: Fundamental Concepts of Bio-informatics, Pearson Education.

Paper-IV(1) (MCS-341):Artificial Intelligence

General Issues and Overview of AI: The AI problems, what is an AI technique?

Problem Solving, Search and Control Strategies: General problem solving, production systems, control strategies: Forward and backward chaining. Exhaustive searches: Depth and Breadth first search.

Heuristic Search Techniques: Hill climbing, Branch and Bound technique, Best first search & A* algorithm, AND/ OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems, means ends analysis.

Knowledge Representation: First order predicate calculus, skolemization, resolution principle & unification, interface mechanism, Horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.

AI Programming Language: PROLOG: Introduction, Clauses: Facts, goals and rules. Prolog unification mechanism, arithmetic operator, list manipulations, Fail and Cut predicates.

Natural Language Processing: Parsing techniques, context-free grammar, Case and Logic grammars, Semantic Analysis.

Planning: Overview- An Example Domain: The block word, component of planning systems, goal stack planning (linear planning), non-linear planning using goal sets.

Handling Uncertainty: Probability theory, Bayes theorem and Bayesian networks, Certainty factor, Fuzzy Logic.

Expert Systems: Introduction to expert system, knowledge acquisition, case studies: MYCIN.

Recommended Books:

1. Elaine Rich and Kelvin Knight: Artificial Intelligence, Tata McGraw Hill.
2. D.W. Patterson: Introduction to Artificial Intelligence and Expert Systems, Prentice Hall of India.
3. Clocksin, W.F and Mellish, C.S: Programming in PROLOG, Narosha Publishing

Paper -IV(2) (MCS-342):Advanced Java Programming

J2EE Platform: Enterprise architecture style: 2 tier, 3 tier, n tier, J2EE platform: run time, APIs, J2EE technology: web components, EJB.

Database Programming with JDBC: Database drivers, java.sql package, javax.sql package, connection pooling, distributed transactions.
Servlet Programming: Servlet implementation, servlet configuration, servlet life cycle.

Directory Services and JNDI: Naming and directory services, using JNDI, JNDI service providers, Java and LDAP.

Distributed Computing using RMI: RMI architecture, RMI exceptions, developing applications with RMI, parameter passing in RMI, custom sockets and SSL.

JSP Basics and Architecture: JSP directives, scripting elements, standard actions, implicit objects.

Javamail: mail protocols: SMTP, POP3, IMAP, MIME, javamail API, working with mail.

EJB Architecture and Design: What are EJBs, EJB container and its services, working with EJB, design of the EJB tier.

Suggested Book:
1. S. Allamaraju and C. Buest: Professional Java Server Programming J2EE 1.3 Edition, SPD.

Paper -V(1) (MCS-351):Embedded System Design

Overview: Overview of embedded systems, Design challenge, Processor technology, IC technology, Design Technology.

Custom-Single purpose processors: Custom single purpose processor design, optimizing custom single processors.

General-Purpose Processors: Basic architecture, operation, programmers view, development environment, selecting a microprocessor.

Application Specific Instruction Set Processor (ASIP) Design: ASIP Design methodologies, steps involved in ASIP design: application analysis, design space exploration, generation of software tools like compiler, debugger, instruction set simulator etc., synthesizing processor. Simulation based and scheduler based design space exploration techniques and their comparison.

Standard single-purpose processors: peripherals Timers, counters, watchdog timers, UART, Pulse width modulator, LCD controller, Keypad controller, ADC, Real time clocks.

Memory: Memory write ability and storage performance, Common memory types, composing memories, memory hierarchy and cache, advanced RAM: DRAM, FPM DRAM, EDO DRAM, SDRAM, RDRAM, Memory management Unit.

Interfacing: Arbitration, Muti-level bus architectures, Serial protocols: I2C bus, CAN bus, Fire Wire bus, USAB, Parallel protocols: PCI and ARM bus, Wireless Protocols: IrdA, Bluetooth, IEEE802.11.

Digital Camera: Case study of embedded system.

Control systems: Open loop and closed loop systems, General control systems and PID controllers, Practical issues related to computer based control, Benefits of computer based control implementations.

Recommended Book:

1. Frank Vahid & Tony Givargi s: Embedded system design: A unified hardware/software Introduction, John Wiley & Sons Inc. 2002.

Paper -V(2) (MCS-352):Image Analysis and Computer Vision

Image Sensing and Representation: What is image processing? Steps in image processing, components of image processing system. Elements of visual perception, image sensing and acquisition: fundamentals of CCD, Camera, fundamentals of Scanner. Representation of images and image file formats. Gray level and spatial resolution.

Image Analysis: Preprocessing. Edge/Line Detection. Segmentation. Discrete Transforms. Feature Extraction and Analysis.

Image Restoration*:* Noise Removal Using Spatial Filters. Frequency Domain Filters. Geometric Transforms.

Image Enhancement: Basic gray level transformations, histogram processing: histogram equalization, histogram matching, use of histogram statistics. Smoothing filters: linear and non-linear smoothing filters. Sharpening filters: Use of first derivative based filters.

Image Compression. Loss-less Compression Methods. Lossy Compression Methods.

Introduction to Computer Vision: Understanding acquisition, characteristics, processing and display of digital images being used in common computer-based applications like medical image processing, remote sensing. The CVIP tools Software. Human Visual Perception.

Tools for image analysis and computer vision: Different tools and software packages available: Detailed study of popular tool (to be selected)

Recommended Books:

1. R.C. Gonzalez and R,E, Woods: Digital Image Processing, Prentice Hall of India.
2. B. Chanda and D. Dutta Majumbdar: Digital Image Processing and Analysis, Prentice Hall of India.

Paper-VI (MCS-306)
Practical-I Minor Project

Paper -VII(MCS-307)
Practical - II ELECTIVE Lab

Practicals based on Elective Paper offered by the candidates

FOURTH SEMESTER

Paper-I (MCS-401):Project Work

Project in the semester IV examination shall carry 100 marks for internal assessment and following grading system will be followed in the external examination conducted by the University.
Excellent / Very Good/ Good / Satisfactory / Unsatisfactory.