**SIDO KANHU MURMU UNIVERSITY**

**DUMKA, JHARKHAND**

**MCA 2 Years Course Structure**

**Preamble**

Master of Computer Application (MCA) has been restructured to be a two-year postgraduate course instead of the existing three-year postgraduate degree course vide AICTE circular No. F. No. AICTE/AB/MCA/2020-21 Dated 03.07.2020.

**Eligibility Qualifications**

Those who have passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree. OR passed B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying examination.

**Why has AICTE Decided to Make MCA a Two Year Course?**

It has long been observed that the number of candidates taking admission to a three-year MCA course has been declining over the years. The AICTE decided to reduce the MCA course term from 3 years to 2 years due to a depleting enrolment rate for the course in the last few years. Apart from that, there has been a significant rise in the number of students with a BCA, B.Sc IT, and B.Sc Computer Science degrees seeking admission in the MCA course. As a result of these findings, AICTE has now decided to reduce the duration of the MCA course from three years to two years. University Grants Commission (UGC), the higher education regulator of the country is in agreement with the same as it is decided in the 545th Meeting of University Grant Commission held on l9.l2.20l9.

**How will the MCA Course Curriculum Change?**

The change in the duration of the MCA course will not impact the existing curriculum and course structure severely. As per the current MCA syllabus, the first-year curriculum covered the basic concepts of coding and related topics only. With this new ruling coming into effect, this introductory part of the MCA course will be scrapped. Students will directly be introduced to the advanced concepts of an MCA programme.

**Are Students from Non-IT Background Eligible for Revised Two Year MCA Course?**

Now that the course structure and duration have been changed/ reduced, the question that arises is that will students from a non-IT background such as B.Sc Chemistry, B.Sc Physics, B.Sc Mathematics, etc., still be eligible to get admission in the two year MCA course.

As per AICTE handbook for the 2020-2021 academic session, candidates from the non-IT background will be eligible to apply for 2-year MCA courses only if they have studied Mathematics in class 12th. In addition to this, the candidates will have to take a bridge course after enrolling for the MCA course where they will be introduced to the basic concepts of computer applications required for the programme.

**When will AICTE Implement the Decision to Make MCA a Two Year Course?**

As per the AICTE circular, the revised MCA course duration will be applicable from the upcoming academic session 2020-21.

**What will happen to Students who are Currently Enrolled in the 3-year MCA Course?**

The change will be implemented from the academic session of 2020-2021. All students already enrolled in the MCA course will follow the same pattern and their course curriculum or course structure will not be affected.

**Total Credits of the Course**

There is no mention of the total credit, structure on the 2 years MCA program on AICTE/UGC site, however, some universities has decided on the credits as follows.

IPU Credits (28+26+25+27=103)

HCU Credits (19+19+17+12=67)

VTU Credits (24+26+26+24=100)

JNU Credits (20+20+20+12=72)

Accordingly, the committee has decided the course structure of the MCA program as follows.

**MCA Program Objectives**

* To train the graduates to acquire in depth knowledge of fundamental concepts and programming skills for holistic development
* To prepare the graduates for productive careers in software industry, corporate sector, Government Organizations.
* To prepare graduates to acquire excellent computing ability so that they can analyse, design and create Solutions for real time problems.
* To apply the current tools and techniques to create systems for solving Industry oriented problems.
* To prepare graduates to gain multidisciplinary knowledge through real time case studies, projects and industry internship to meet the industry needs.

**Bridge Courses**

* Bridge course is an eligibility criterion to be determined by the Institution. There is no mention on how the Bridge course will be determined. Based on the suggestions, the following may be decided as the criteria to determine the Bridge Course.
* If a candidate has done any of the TWO papers of Computer Science (Given in Table Below) at Undergraduate level, it will be treated as bridge course.

|  |  |
| --- | --- |
| Knowledge of Computer Programming | Operating Systems |
| Discrete Mathematics | Probability & Statistical Methods |
| Numerical Methods | Digital Electronics |
| Information Technology | Computer Organization |
| Fundamentals of Programming Languages | Database Management Systems |

**CHOICE BASED CREDIT SYSTEM (CBCS)**

The proposed CBCS system has the potential of providing a choice of a wide spectrum of subjects/branches of subjects to students in pursuit of achieving their cherished goals. This system has been globally accepted and now has become the need of the day. The UGC also has provided guidelines to the Universities for consideration and implementation of CBCS. The University Department of Computer Applications proposes the following courses and credits to be initiated at MCA w.e.f. the session 2020-22. The proposed system may be modified/improved in future according to the requirements.

**Semester I**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No. | Paper Code | Subject | Credits(L-T-P) | Marks |
| External | Internal | Practical |
|  | MCA C101 | Operating System | (4-0-0) | 70 | 30 |  |
|  | MCA C102 | Data Structure and Algorithms | (4-0-0) | 70 | 30 |  |
|  | MCA C103 | Computer Organization and Architecture | (4-0-0) | 70 | 30 |  |
|  | MCA C104 | Theoretical Foundation of Computer Science | (4-0-0) | 70 | 30 |  |
|  | MCA C105 | Computer Based Optimization Techniques | (4-0-0) | 70 | 30 |  |
|  |  |  |  | 350 | 150 |  |
|  |  | Total | 20 | 500 |  |

**Semester II**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.No. | Paper Code | Subject  | Credits(L-T-P) | Marks |
| External | Internal | Practical |
| 1 | MCA C201 | Data Base Management System | (3-0-0) | 70 | 30 |  |
| 2 | MCA C202 | Data Communication and Computer Networks | (4-0-0) | 70 | 30 |  |
| 3 | MCA C203 | Object Oriented Programming in JAVA | (3-0-0) | 70 | 30 |  |
| 4 | MCA C204 | Software Engineering | (4-0-0) | 70 | 30 |  |
| 5 | MCA C205 | Artificial Intelligence  | (4-0-0) | 70 | 30 |  |
| 6 | MCA P206 | DBMS Lab | (0-0-1) |  |  | 50 |
| 7 | MCA P207 | JAVA Lab | (0-0-1) |  |  | 50 |
|  |  | Total | 20 | 600 |

**Semester III**

|  |  |  |  |
| --- | --- | --- | --- |
| S.No. | Paper Code | Subject | Credits(L-T-P) |
| 1 | MCA C301 | Research Methodology | To be determined by the papers floated as elective. |
| 2 | MCA E302-305 | Elective-I  |
| 3 | MCA E306-309 | Elective-II  |
| 4 | MCA E310-313 | Elective-III  |
| 5 | MCA E314-317 | Elective-IV  |
|  | Total  | 20 |

**Semester IV**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sl No. | Paper Code |  | Credits(L-T-P) | Marks |
| External | Internal | Practical |
| 1 | MCA C401 | Web Based Programming | 4-0-0 | 70 | 30 |  |
| 2 | MCA P402 | Industrial Project/Internship/In-House Project | 8 | 500 |  |  |
|  |  | Total | 12 | 600 |

**Note:** Communication Skills and Technical Writing as Zero-Credit courses during summer or on SWAYAM/ other online platforms with supervision/evaluation by the faculty.

|  |  |  |
| --- | --- | --- |
| **Paper Code** | **List of Elective Courses** | **Paper Code** |
| **Elective I** |
| MCA E302 | Microprocessors | Computer Graphics  | MCA E303 |
| MCA E304 | Probability and Statistics | Machine Learning | MCA E305 |
| **Elective II** |
| MCA E306 | Advanced Data Structure & Algorithms | Dot Net Using C# | MCA E307 |
| MCA E308 | Cloud Computing and IoT | Compiler Design | MCA E309 |
| **Elective III** |
| MCA E310 | Wireless and AdHoc Networks | Parallel Computing | MCA E311 |
| MCA E312 | Distributed Computing | Digital Image Processing | MCA E313 |
| **Elective IV** |
| MCA E314 | Simulation and Modelling | Mobile Communication and Computing | MCA E315 |
| MCA E316 | Natural Language Processing | Software Testing | MCA E317 |
| MCA E318 | Big Data | Network Security And Cryptography | MCA E319 |

# **REGULATIONS**

1. **Preamble**
2. The regulations herein specified applied to Master of Computer Applications (MCA) programme offered by the Sido Kanhu Murmu University, Dumka, through the University Department of Physics, here in after referred to as the University Department.
3. The MCA programme covered by these regulations are correlated courses of study, the successful completion of which would enable the participants of the programme to qualify for the award of

MCA degree.

1. A participant of the programme is a student who is duly admitted to an institute of the university and who has registered himself/herself for a course of study and attains the same.

1. **Time scale for academic activity**
2. The basic units of time for academic activity for the MCA programme shall be a semester (July to December and January to June). A basic contact period is one in which a teacher engages the student for a duration of 60 minutes.
3. If circumstances warrant, the department may schedule a summer programme during long vacation of the department. There will be in general no formal classes in the summer programme.

1. **Courses of study**

The university shall offer courses during a semester indicated mainly from consideration of minimum enrolment and facilities available. The competent authority comprising of the University/Department shall have the right to cancel any or all course of study if the requirements are not satisfied.

1. **Registration for course of study**
2. Every participant of the MCA programme, shall first register himself/herself for the courses of study he/she intends pursuing provided he/she possesses the minimum qualifications as laid down and his/her plan is approved by the University in the University Department of Computer

Applications.

1. Fees payable by the participants including fees payable for examination shall be as laid down in administrative instructions issued from time to time by the University/Department for the purpose.

1. **Audit of the courses**

All courses offered in the MCA programme will be open for audit in the spirit of offering an opportunity for continuing education for the participants who wish to refresh or update their knowledge. Audited courses shall neither count for academic credit nor shall there be any examination requirements. Participants shall be eligible to participate in the courses offered on

payment of prescribed fee and due registration.

1. Measurement of Academic Achievement of the participating student in the MCA programme shall be measured in terms of grade obtained by him/her in the examinations. The overall performance of the students in the semester examination shall be evaluated in terms of grade point average as specified later.

1. **Assessment:**

In total 72 credits represent the workload of a session for MCA program.

Total credits=72, 1 credit = 15 lecture Hrs 100 marks

 Semester – I 20 credits

 Semester – II 20 credits

 Semester – III 20 credits

 Semester – IV 16 credits

1. **Scheme of Instruction:**

The scheme of instruction in Post-Graduate Programme shall be of the following forms of academic activity:

* 1. Theory
	2. Sessional
	3. Practical Training and Project Work
	4. Seminar and Tutorial

1. **THEORY:** A theory type of academic activity shall involve concepts, fundamental ideas, and techniques, as laid down in text books or literature and which can be grasped through lectures and assignments. A theory type of course with about 60 contact periods in a semester shall enable participating student to earn one unit of academic credit provided that he/ she fulfils the attendance,

and grade requirements as specified hereinafter.

1. **SESSIONALS:** The following type of academic work will be covered in sessional:

a) Laboratory Experiment

* + 1. Design Exercise
		2. Project
		3. Term paper or any other academic work, the purpose of which would be to train the student by practice, repeated use and hands on experience.

A sessional course of 2 contact periods a week and about 30/40 contact period during a semester shall enable a participating student to earn one unit of academic credit provided that he/she fulfils the attendance and grade requirements as specified hereinafter.

1. **Practical Training and Project Work:** At the end of the fourth semester of study, a student will beexamined in the course" Project Work".
	1. Project work may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.
	2. Students should take guidance from an internal guide and prepare a Project Report on "Project Work" in 2 copies to be submitted to the Director of the Institute by April. Whenever possible, a separate file containing source-code listings should also be submitted. Every student should also submit at least 4 typed copies of their project synopsis.

|  |
| --- |
| 1. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, DFDs, ERDs, File designs and a list of output reports should be included.
2. The project Work should be of such a nature that it could prove useful or be relevant from the commercial/management angle.
3. The project report will be duly accessed by the internal guide of the subject and marks will be communicated by the Director to the University along with the marks of the internal credit for theory and practical to be communicated for all other courses.
4. The project report should be prepared in a format prescribed by the University, which also specifies the contents and methods of presentation.
5. The major project work carries 200 marks for internal assessment and 300 marks for external viva. The external viva shall be conducted by a minimum of two external examiners. The mini project work would be departmental.
6. Project work can be carried out in the Institute or outside with prior permission of the Institute.
7. Project viva-voce by the University panel will be conducted in the month of May.
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| 1. **Attendance Requirement**

All students must attend every lecture, practical classes and other activities of the Department. However, the attendance requirement will be a minimum of 75% of the classes actually held. **Absence during the semester** 1. A student must inform the HOD concerned immediately of any instance of continuous absence from classes.
2. A student who is absent due to illness should approach the teachers concerned for makeup quizzer, assignment and laboratory work.
3. A student has been absent from a sessional test due to illness approach the teacher concerned for makeup test immediately on return to class. The request should be supported with a medical certificate issued by a registered medical practitioner.
4. If a student is continuously absent from the institute for more than four weeks without permission of the head of the department concerned, his/her name will be removed from institute rolls.
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| 1. **Examination Assessment**
2. The examination of each paper shall have two components- External evaluations (End Semester Exam) at the end of the semester carrying 70 marks to be conducted by the university and Internal evaluation of 30 marks to be evaluated by Teachers. Internal evaluation shall comprise written exam carry 20 marks of a paper. Seminars/Cultural activities/NSS be 5 marks and 5 marks for assignment.

Theory Paper-------------- 70 marks + 30 marks 70 marks ------------------- External evaluation (End Semester Exam) 30 marks-------------------- Internal evaluation  1. Question Paper Pattern:

The questions papers shall be set and the answer –scripts shall be evaluated by the teachers of the concerned courses. The question paper shall consist of three sections: A, B, C Section A, will be compulsory and have ten questions from the respective units of the syllabus in the form of Very Short Answer Questions carrying 2 marks each i.e total of 20 marks. Section B will consist of 8 short answer type questions which will cover the entire syllabus uniformly and will carry 20 marks in all, each short-answer type questions carrying 5 marks each out of which the students will answer only 4 questions. Group C will also consist of 7 long answer type questions which will cover the entire syllabus uniformly and will carry 30 marks in all, each long question answer type question carrying 10 marks each out of which the students will answer any 3 questions.1. In order to pass MCA semester examination a student must clear all the papers in that semester with at least 45% marks in each theory, sessional work and practical examination separately.
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1. **Student Discipline**

Every student is required to observe a polite and disciplined behaviour both inside and outside the campus and should not indulge in any activity which would tend to bring down the prestige of the institute or disturb the peaceful and congenial environment of the campus.

An act of indiscipline on the part of the student may result into adequate discredit and a mention in his/her academic grade card and/or transcript.

**Note:** The department in consultation with the university shall have the right to change/modify any

regulationor part thereof in the academic interest of the students.

1. **DURATION OF CURRICULUM AND CALENDAR:**
	1. Master of Computer Applications (MCA) programme is of two years’ duration. Each year shall be divided into two semesters. First semester shall ordinarily begin in July and end in December. Second semester shall ordinarily begin in January and end in June.
	2. Each year, the university shall draw an academic calendar and the same shall be non-negotiable and strictly adhered to the academic calendar for the first year shall be handed over to each admitted student along with his/her university registration card. Second year academic calendar shall be made available during registration for third.
	3. The curriculum and syllabus shall be modified with approval of the academic council ordinarily once in every three years to keep the same up-to-date. However, minor modifications can be done as and when necessary with the approval of Vice-Chancellor. The modification so done shall be placed to the immediate next academic council meeting for ratification.
	4. A candidate may be permitted to complete MCA degree requirements in not more than 4 years i.e. maximum in 8 semesters.
2. **ELIGIBILITY CRITERIA FOR ADDMISSION: -**
	1. Those Candidates with BCA/ Bachelor Degree in Computer Science Engineering or Equivalent Degree or Passed B.Sc/B.Com/ B.A with Mathematics at 10+2 Level or at Graduation Level (with additional bridge courses as per the norms of the University).
	2. The candidate must have secured at least 50% (45% for reserved category) of marks in aggregate at the graduation level.
	3. Candidates appearing for the final examination of their bachelor’s programme can also apply and if selected can join the programme provisionally. At the time of counselling they must bring the certificates in original.
	4. At the time of the counselling candidates will be required to show their original certificates andmark sheets of 10+2 and graduation level, MCA test admit card, caste certificate and any special category certificate, if any.
3. **Eligibility for Appearing in Semester Examination**
	1. A student shall be eligible in an examination provided he/she pursues a regular course of study and attends at least 75% of class in each theoretical and sessional subject during the semester. The attendance shall be considered from the date of admission of the candidate in the institution Attendance record will be compiled at the time of each test and the students with poor attendance will informed through notification. The guardian will also be informed through a letter before he/she is debarred for appearing university examination due to shortage of attendance.
	2. Concessions: A student who has been absent for short periods on medical ground or due to participation in cultural, sports, other academic/official assignments in the interest of the Department/University with prior written permission of the head of the institution shall be permitted a maximum of additional concession of 10% in attendance and shall be eligible for appearing in examination with a minimum 65% of attendance in semester.
	3. A student shall be admitted to any examination in a subject only if he/she has been registered for that S
	4. A candidate shall be allowed in an examination only if he/she is issued an admit card for the relevant examination by the University/Department.
	5. **Mode of Selection:** Candidate will be selected on the basis of their performance in the entrance test, conducted by the Univesity. The state reservation policy will be followed. The entrance test shall be a written examination of 2 hours duration of 100 marks containing MCQ which will be conducted by the Department of MCA.
	6. **Fees Structure:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sl No. |  |  |  |  |
| Registration Fees (One Time | 600/- |
| Development Fees (One Time) | 1000/- |
| I Card (One Time) | 100/- |
| Library Fees (One Time) | 1000/- |
| Fees Semester Wise | Sem I | Sem II | Sem III | Sem IV |
| 1. Examination
 | 2935/- | 2935/- | 2935/- | 4185/- |
| 1. Tuition Fees
 | 28000/- | 28000/- | 28000/- | 28000/- |

1. **PROMOTION**

Advancement to the next Semester shall be permitted only with a maximum of Two Backlog Papers from the preceding Semester. Further, entry to the next Semester shall be regulated at the level of 3rd ,4th Semesters as explained under:

* 1. Admission to 4th Semester shall be allowed only after clearing First Semester Backlog Paper(s) during Third Semester.
	2. Backlog paper(s) of 2nd Semester needs to be cleared during 4th Semester.
	3. Backlog paper(s) of 3rd Semesters need to be cleared during subsequent examinations for these semesters within three consequent examinations of the concerned semester.

**Moderation of result:** Not withstanding anything contained elsewhere in the Regulations, the

University shall have power to moderate the MCA results on the recommendations of the Examination Board and/or the academic council.

Normally an examinee shall be awarded up to five marks in one theory paper or three marks in two theory papers (each). If he/she fails short of pass marks in semester exam (first to fifth) or up to five marks in the aggregate. There should not be more than one benefit.

 Provided further that no grace marks shall be permitted in the Practical/Viva-Voice paper.

1. **Final Result:**

Semester Grade Point Average (SGPA) = (Total Points) / (Total No. of paper) Cumulative Grade Point Average (CGPA) = (Total Semesters SGPA) / (Total Semester) Grade will be Awarded According to the Point.

$$CGPA=\frac{\sum\_{i}^{}C\_{i}P\_{i}}{\sum\_{i}^{}C\_{i}}$$

**The Cumulative Grade Point Average (CGPA) will be calculated on the 10-point grading scale as follows:**

|  |  |  |
| --- | --- | --- |
| **Grade Point**  | **Percentage of Marks**  | **Grade Symbol (Letter)**  |
| **10**  | **91-100**  | **O (Outstanding)**  |
| **09**  | **81-90**  | **A+ (Excellent)**  |
| **08**  | **71-80**  | **A (Very Good)**  |
| **07**  | **61-70**  | **B+ (Good)**  |
| **06**  | **51-60**  | **B (Above Average)**  |
| **05**  | **45-50**  | **P(Pass)** |
| **04**  | **Below 45** | **Fail**  |

The concerned teacher shall maintain all records for inspection by the University for at least one semester.

**OPERATING SYSTEMS**

**(MCA-101)**

**UNIT 1:**

Introduction: Introduction to OS Operating system functions, evaluation of O.S., Different types of O.S. batch, multi-programmed, time-sharing, real-time, distributed, parallel. System Structure Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, virtual machine), O/S services, system calls.

**UNIT 2:**

Processes: Concept of processes, process scheduling, operations on processes, operating processes, inter-process communication. Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores. Threads: overview, benefits of threads, user and kernel threads. CPU scheduling: scheduling criteria, pre-emptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

**UNIT 3:**

Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock. Memory Management: background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

**UNIT 4:**

File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and non-blocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

**UNIT 5:**

Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

Protection & Security: Protection & Security Goals of protection, domain of protection, security problem, authentication, one-time password, program threats, system threats, threat monitoring, encryption.

**Text Book:**

1. A. Silberschatz, Galvin-Operating System Concepts, 6th Edn, John Wiley, Indian Reprint, 2003.

**Reference Books:**

1. C.Cronsley-Operating Systems: A Design-Oriented Approach, TMH, New Delhi, 2002
2. H.M.Deitel-Operating Systems, 2nd Edn, Pearson Education, 2003.
3. A.S.Tanenbaum-Operating System:Design and Implementation, PHI, New Delhi, 2002.m.
4. The UNIX Operating Systems – Morris Bach.

**DATA STRUCTURES**

**(MCA 102)**

**UNIT I:**

Introduction: Pseudocode, The Abstract Data Type, Algorithm Efficiency. Recursion: Factorial – A Case Study, How Recursion Works, Designing Recursive Algorithms, Another Case Study- Fibonacci Numbers, The Towers of Hanoi.

**UNIT II:**

Linked Lists: List Searches, Linear List Concepts, Linked List Concepts, Linked List Algorithms, Processing a Linked List, List Applications, Complex Linked List Structures, List Abstract Data Type-Linked List Implementation.

**UNIT III:**

Stacks: Basic Stack Operations, Stack Linked List Implementation, Stack Applications, Stack Abstract Data Type Implementation, Stack ADT- Array Implementation. Queues: Queue Operations, Queue Linked List Design, Queuing Theory, Queue Applications, Queue ADT-Linked List Implementation, Queue ADT-Array Implementation.

**UNIT IV:**

Introduction to Trees: Basic Tree Concepts, Binary Trees, Binary Tree Traversals, Expression Trees, General Trees, Huffman Code. Search Trees: Binary Search Trees, AVL Trees, AVL Tree Implementation, AVL Abstract Data Type. Multiway Trees: m-Way Search Trees, B-Trees, Simplified B-Trees. Sorting Concepts: General Sort Concepts, Insertion Sorts, Selection Sorts, Exchange Sorts, External Sorts.

**UNIT V:**

Heaps: Heap Definition, Heap Structure, Basic Heap Algorithms, Heap Data Structure, Heap Algorithms, Heap Applications.

**Text Book:**

1. R.F.Gilberg & B.A. Forouzan- Data Structures: A Pseudocode Approach with C++, 2nd Edn, Brooks/Cole- Thomson Learning, Indian Reprint, 2005.

**Reference Books:**

1. E.Horowitz et.al-Fundamentals of Data Structures in C++, Galgotia Publication, New Delhi, 2006.
2. A.M.Berman- Data Structures vie C++, Oxford Univ. Press, Inc. Indian Reprint, 2002.
3. M.T.Goodrich et.al- Data Structures and Algorithms in C++, John Wiley, Inc. Indian Reprint, 2004.
4. Data structure using C : Tanenbaum.

**COMPUTER ORGANIZATION & ARCHITECTURE**

**(MCA-103)**

 **UNIT-I:**

Digital components: Functional units of a computer, logic gates, Minimization of Boolean Expressions, Flip-Flips, Decoders, Encoders, Multiplexers, Counters, and Registers. Data Representation: Number systems, Representations of signed and unsigned numbers, alphanumeric codes, Addition of binary numbers, subtraction, 2's complement, and Floating point number representation.

**UNIT-II:**

Register Transfer Language & Micro-operations: Concepts of the Bus, Timings in Register transfer, Languages used for data transfer in registers, Data movement from/to memory, Arithmetic circuits, Half adder, full adder, N-bit adder, Logical micro operation, arithmetic logic unit. Instruction sets for basic computer: Addressing modes, Instruction cycles, Control signal generation.

**UNIT-III:**

Central Processing Unit: General register organization, Memory stacks, Instruction types, Interrupts, Instruction pipelining, Arithmetic pipelining. Input Output Organization: Input devices, output devices, synchronous and asynchronous communication, Modes of data transfer from I/O to memory, Vector and Priority Interrupts, Direct Memory Access, Input Output Interface.

 **UNIT-IV:**

Memory Organization: Comparison of different types of memories, Main memories, Memory management. Cache memory organization: Locality of reference, Hit ratio, Mapping process. Virtual memory organization: Mapping addresses space into memory space, page replacement.

**Text Books:**

1. M. Moris Mano, Computer System Architecture, Prentice Hall of India, 6th Edition.
2. John P. Hayes, Computer architecture and organization, Tata McGraw Hill, 4th Edition.

**Reference Books:**

1. P. N. Basu, Computer Organization and Architecture, Vikas Publication, 2nd Edition.
2. H. Patterson, Computer Architecture: A Quantitative approach, Elsevier, 5th Edition.
3. W. Stalling, Computer Organization and architecture, Pearson Education Asia, 5th Edition.
4. Donald Leach & Albert Malvino, Digital Principles & Applications, McGraw Hill, 7th Edition.

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| **THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE****(MCA-104)** |
| **UNIT I** |
|  Propositions and Compound Propositions – Logical Operations – Truth Tables –Tautologies and Contradictions – Logical Equivalence –Algebra of Propositions – Conditional and Biconditional Statements – Arguments – Logical Implication – Quantifiers – Negation of Quantified Statements – Basic Counting Principles – Factorial – Binomial Coefficients – Permutations – Combinations – Pigeonhole Principle – Ordered and Unordered Partitions. |
| **UNIT II** |
| Order and Inequalities – Mathematical Induction – Division Algorithm – Divisibility – Euclidean Algorithm – Fundamental Theorem of Arithmetic – Congruence Relation – Congruence Equations – Semigroups – Groups – Subgroups – Normal Subgroups – Homomorphisms – Graph Theory: basic definitions-paths, reachability, connectedness matrix representation of graphs, trees. |
| **UNIT III** |
| Finite Automata and Regular Expressions: Finite State Systems – Basic definitions – Non-deterministic finite automata – Finite automata with e-moves – Regular expressions. |
| **UNIT IV** |
| Properties of Regular sets: Pumping lemma – Closure properties – Decision Algorithms – My hill – Nerode Theorem – Context Free Grammars – Derivation Trees. |
| **UNIT V** |
| Simplifying Context free grammars - Chomsky normal forms – Greibach Normal forms – Pushdown automata and context-free languages. |
| **Text Books** |
| 1. J.P.Tremblay and R.Manohar, 1997, DiscreteMathematical Structures with applications to Computer Science, Tata McGraw-Hill,New Delhi.
2. P.Linz, 1997, An Introduction to Formal Languages and Automata, Second Edition, Narosa Pub. House, New Delhi.
3. Lipschutz and M. Lipson, 1999, Discrete Mathematics, Second Edition, Tata McGraw-Hill, New Delhi.
4. J.E.Hopcraft and J.D.Ullman, 1993, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, New Delhi.
 |
| **Reference Books** |
| 1. D.C.Kozen, 1997, Automata and Computability, Springer-Verlag, New York.
2. J. Martin, 2003, Introduction to Languages and the Theory of Computation, 3rd Edition, Tata McGraw-Hill, New Delhi.
 |

**COMPUTER BASE OPTIMIZATION TECHNIQUES**

**(MCA-105)**

**UNIT I**:

Preliminaries: Inventory Models and Replacement problems: Inventory models –various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, Replacement problems-capital equipment-discounting costs-replacement in anticipation of failure- group replacement-stochastic nature underlying the failure phenomenon.

**UNIT II:**

Linear Programming Problems (LPP): Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes’ Big-M Method, Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

**UNIT III:**

Integer Linear Programming Problems: Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method, 0-1 integer linear programming problem. Transportation Problems: Introduction to Transportation Model, Matrix Form of TP, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel’s Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution. Assignment Problems: Definition, Hungarian Method for AP.

**UNIT IV:**

Introduction to NLP: Definition of NLP, Convex Programming Problems, Quadratic Programming Problems, Wolfe’s Method for Quadratic Programming, Kuhn-Tucker Conditions, Geometrical Interpretation of KT-Conditions, KT-Points etc. Dynamic Programming: Bellman’s Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

**UNIT V:**

Queuing Theory Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Memoryless Distribution, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson Queues.

**Text Books:**

1. Hadley, G.,”Linear Programming, and Massachusetts”, Addison-Wesley .
2. Taha, H.A, ”Operations Research – An Introduction”, Macmillian
3. Hiller, F.S., G.J. Lieberman, ” Introduction to Operations Research”, Holden-Day.
4. Harvey M. Wagner, “Principles of Operations R esearch with Applications to Managerial Decisions”, Prentice Hall of India Pvt. Ltd.
5. Swarup K , “Operation Research”, S. Chand New Delhi.

**SEMESTER II**

**DATABASE MANAGEMENT SYSTEMS**

**(MCA-201)**

**UNIT I:**

Introduction: File systems versus Database systems, Advantages of DBMS, DBMS classification/types, DBMS structure, three schema DBMS architecture, Data Models, Data Independence, Data abstraction, Database Users, Database Schemas and Database Instances, Views and its advantages, Data dictionary, DBA and its functions, RDBMS, Difference between DBMS and RDBMS.

**UNIT II:**

E-R-Model & Relational Model: Entities and Entity Sets, Relationships and Relationship Sets, Keys, Mapping, Constraints, ER Diagram, Reducing ER Diagram to tables, Specialization, Generalization and Aggregation. Codd’s rule, RDBMS Concepts, Types of Keys, Constraints, Relational database Scheme, Procedural & Non Procedural Languages, Relational Algebra, Relational Calculus.

**UNIT III:**

SQL/PLSQL: Basic Concepts, Basic SQL, Advance SQL,Databse languages, Set operations, Aggregate Functions, Null Values, assertions, views, Nested Sub-queries, ,Integrity Constraints, Domain Constraints, Referential Integrity Constraints, Indexing and Hashing, Cursors, Stored procedures and triggers .

**UNIT IV:**

Database Design: Pitfalls in relational database design, Normalization using functional, Multivalued and join dependencies, Atomic values, alternative approaches to database design. Full and Partial Functional Dependency, Armstrong’s axioms, Canonical Cover, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, DKNF .

**UNIT V:**

Transaction Processing and Concurrency Control: DBMS Transaction, ACID Properties, Serializability, States of Transaction, DBMS Concurrency control, DBMS deadlock, Deadlock Prevention, Deadlock avoidance, Schedules and Recovery, Locking and Timestamp Ordering for concurrency control.

**Text Book:**

1. Fundamentals of Database Systems "Ramez Elmasri", Pearson Education.

**Reference Books:**

1. Database Systems Concepts "A. Silberschatz,Korth", McGraw Hill.
2. Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke
3. SQL Solutions for IBM DBMS (Vnr Computer Library) by Bruce L. Larson
4. Database Management Systems (DBMS) by Icon Group International
5. Database Systems Concepts "KORTH”

**DATA COMMUNICATIONS AND COMPUTER NETWORKS**

**(MCA-202)**

**UNIT I:**

Introduction: Introduction, Types and Applications of Network, Reference models: OSI, TCP/IP. Signals: Analog, Digital, Digital transmission - Coding, Sampling, Analog Transmission - Modulation of Digital and analog signals, Multiplexing, Switching, Transmission Media, Transmission impairment.

**UNIT II:**

Data Link Layer: Responsibilities of DLL: Services to network layer, Framing, Error control, Flow control. Error detection and correction: Hamming distance, Cyclic Redundancy Check.

DLL Protocol: Stop-and-Wait Sliding window protocol, Piggybacking, Go-Back-N, Selective repeat.

MAC sublayer: Channel allocation, ALOHA (pure and slotted), Carrier sense multiple access (CSMA), CSMA/CD, Ethernet, Manchester Encoding, Wireless LANs, Bridges, Switches.

**UNIT III:**

Network Layer: Host-to-Host Delivery: Internet working, Addressing and Routing, Network Layer Protocols: ARP, IPv4, ICMP, IPv6, Unicast and Multicast Routing: Routing Protocols.

**UNIT IV:**

Transport Layer: Process-to-Process Delivery: UDP and TCP, Congestion Control and Quality of Service.

**UNIT V:**

Application Layer: Client-Server Model: Socket Interface, Domain Name System (DNS), Electronic Mail (SMTP), and File Transfer (FTP), HTTP and WWW, Multimedia.

**Text Book:**

1. Forouzan B, Data Communications and Networking, 2nd Edition, Tata McGraw-Hill, New Delhi, India 2006

**Reference Books:**

1. Stallings W. Data and Computer Communications, 7th Edition, Prentice Hall India, New Delhi – 2007

2. P.C. Gupta- Data Communications and Computer Networks, PHI, New Delhi, 2006.

3. Tanenbaum: Computer networks

4. R. Stevens: TCP/IP Illustrated volume.1

5. Beej Guide: Socket Programming.

**OBJECT ORIENTED PROGAMMING USING JAVA(CORE)**

**(MCA-203)**

**UNIT I:**

Principles of Object-oriented Programming: Object-oriented Programming Paradigm, Basic Concepts of Object-oriented Programming, Benefits of OOPs, Object- oriented Languages, Application of OOP, Creating the Source File, Compiling and Linking. Tokens, Expressions and Control Structure: Introduction, Tokens, Keywords, Identifiers, Basic Data Types, User Defined Data Types, Derived Data Types, Symbolic Constants, Type Compatibility, Declaration of Variables, Dynamic Initialization of Variables, Reference Variables, Operators, Expressions and Implicit Conversions, Operator Precedence, Control Structures.

**UNIT II:**

Classes and Objects: Defining a Class, Adding Variables and Methods, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods. Arrays within a Class, Memory Allocation for Objects, Static Data Member, Static Member Functions, Arrays of Objects, Objects as Function Arguments.

**UNIT III:**

Inheritances: Extending Class: Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control. Interface & Packages: One-Dimensional & two Dimensional, strings, Vectors, wrapper Classes, Defining Interface, Extending Interface, Implementing Interface, Accessing Interface, Variable, System Packages, Using System Package, adding a Class to a Package, Hiding Classes.

**UNIT IV:**

Threads: Creating Threads. Extending the Threads Class, Stopping and Blocking a Thread, Life-Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Runnable Interface.

**UNIT V:**

Applets: Local and Remote Applets Vs Applications Writing Applets, Applets Life- Cycle, creating an Executable Applet, designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, Passing Parameters to Applets, Aligning the Display, HTML Tags & Applets, Getting Input from the User.

**Text Book:**

1. Richard A. Johnson, “An Introduction to Java Programming and Object-Oriented

Application Development”, 1st Edn., Thomson Learning, New Delhi – 2007

**Reference Books:**

1. Simply Java and Introductions to JAVA Programming, James R Levenick

2. Java 2 complete, sybax

3. Java 6 Programming Black Book, Dream Teach

4. Programming with JAVA, E. Balaguruswamy

**SOFTWARE ENGINEERING**

**(MCA-204)**

**UNIT I:**

Introduction to Software Engineering: Evolving Role of Software, Changing Nature of Software, Legacy Software, Software Engineering – A layered Technology. Software Characteristics, Software Application, Software Engineering Process and Design Model, Waterfall Model, Incremental Process Models, Prototype Model, Spiral Model, Evolutionary Process Models, Agile Process Model.

**UNIT II:**

Requirement & Design Engineering: A bridge to design and construction, Requirement Engineering Task, Initiating the Requirement Engineering Process, Eliciting Requirements, Developing Use case, Building the Analysis Model, Negotiating Requirements, Validating Requirements, Design Process and Design Quality, Design Concepts, Design Models, Pattern Based Software Design.

**UNIT III:**

Testing Strategies and Testing Tactics: Strategic Approach to software Testing, Verification and Validation Testing, White Box Testing, Basic Path Testing Control Structure Testing, Black Box Testing, Object Oriented Testing Methods. Dynamic Testing, Unit Testing, White-box and Black-box Testing, Test Case Generation, Integration Testing, Bottom-up and Top-down Testing, System Testing, Function Testing, Performance Testing, Acceptance Testing, Installation Testing.

**UNIT IV:**

Software Metrics and Project Management: Issues in Project Management, Management Functions, Software Project Management Plan, Software Management Structure, Personnel Productivity, Software Project Complexity. Software Metrics – Basic Consideration, Size Oriented and Function Point Oriented; Software Cost Estimation Techniques, Algorithmic Cost Modelling, The COCOMO Model, Project Scheduling, Software Project Planning, Scheduling Risk Management.

**UNIT V:**

Software Quality and Configuration Management: Quality Concepts, Software Quality Assurance, Software Reliability, Software Configuration Management, SCM Repository, SCM Process.

**Text Book:**

1. Roger S. Pressiman – “Software Engineering – A Practitioner’s Approach”, 6th Edn., McGraw Hill.

**Reference Books:**

1. John Wiley and Sons – “Software Engineering – Principles and Practice –2nd Edn., Haus Van Vliet.

2. Ian Sommerville – “Software Engineering”, 7th Edn., Pearson Education.

3. Karl E. Wiegers Software Requirements (2nd Edition)

4. Grady Booch, etc. Object-Oriented Analysis and Design with Applications (3rd Edition)

5. Cem Kaner, Testing Computer Software (2nd Edition)

**ARTIFICIAL INTELIGENCE**

**(MCA-205)**

**UNIT I:**

Intelligent Agents: Agents & Environment, Nature of Environment, Structure of Agents, Goal Based Agents, Utility Based Agents, Learning Agents.

**UNIT II:**

Problem Solving: Problems, Problem Space & Search: Defining The Problem as State Space Search, Production System, Problem Characteristics, Issues in The Design of Search Programs.

**UNIT III:**

Search Techniques: Solving Problems by Searching, Problem Solving Agents, searching for Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bidirectional Search, Comparing Uniform Search Strategies.

**UNIT IV:**

Heuristic Search Strategies: Greedy Best-First Search, A\* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search for Constraint Satisfaction Problems.

**UNIT V:**

Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Minimax Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening.

**UNIT VI:**

Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation.

**UNIT VII:**

Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge.

**Text Book:**

1. Ritch & Knight -Artificial Intelligence, TMH Reference Books:

1. S. Russel and P. Norvig- Artificial Intelligence A Modern Approach, Pearson Education.

2. Patterson -Introduction to Artificial Intelligence & Expert Systems, PHI

**RESEARCH METHODOLOY**

**MCA C301**

**UNIT I**

Foundation of Research : Introduction, Meaning and Objective, Motivation in research, Research Types, Research Approaches, Significance of Research, Research Process: Data and information, Literature – Meaning and importance, Literature searching and information gathering – need, importance and various sources for literature searching and information gathering, Research process, Criteria of a good research

**UNIT II**

Research Design: Concept and importance in research, Features of a good research design, Technical writing, referencing – Types, need and importance in computer science research, Referencing styles, Writing a research proposal, Techniques to be used in research planning and implementation – Gantt Charts, PERT, CPM (Critical path analysis in research projects). Ethics in research: Review of legal, ethical, social and professional (LSEP) issues including data protection and standards, Ethical issues concerning research participants, researcher and sponsoring organization.

**UNIT III**

Basic Statistics Data, information and system model, Frequency Distribution, Cumulative Frequency Distribution , Graphical Representation of data, Measure of Central Tendency and dispersion, Missing frequencies, Linear Correlation and Linear Regressing Analysis, Correlation – Meaning, Types and significance in research, Types of correlation, Karl Pearson’s coefficient of correlation, Regression – Meaning and significance, Lines of regression.

**UNIT IV**

Hypothesis Testing: Qualities of a good Hypothesis –Framing Null Hypothesis & Alternative Hypothesis, Concept of Hypothesis Testing – Logic & Importance, Testing of Hypothesis, Large Sample Tests, Small Sample Tests (t- Test, F-Test and Chi-Square Test)

Note: Use of SPSS, MATLAB-Statistical Tool Box, etc. for additional knowledge is recommended.

**UNIT V**

Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/Over Leaf/MS Office, Software for detection of Plagiarism

**Text Book**

1. Christian W. Dawson: Projects in Computing and Information Systems (A Student’s Guide). Addison Wesley, 2005. Justin Zobel: Writing for Computer Science. Springer, 2004
2. Research Methodology Methods And Techniques C.R. Kothari, New Age International Pub,2nd Ed
3. Research Methodology Concepts And Cases Deepak Chawla, Neena Sondhi, Vikas Pub.
4. Business Research Methods By By William G.Zikmund, Thomson South-Western, CENGAGE Learning.
5. Statistical Methods – S.P.Gupta, Sultan Chand, NewDelhi 6. Statistical and Quantative Methods – Mr. Ranjit Chitale

**ELECTIVE PAPERS**

**MICROPROCESSOR**

**(MCA E302)**

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| **UNIT I**Control Systems ComponentsRole of control system in instrumentation. Open and close loop control system, types and Block diagram. Servomechanism and regulators with suitable examples. Basic control actions - On-off, Proportional, Derivative, Integral control, Proportional derivative (PD), Proportional integral (PI), P Proportional integral and Derivative (PID) control. Basic control system components –AC/ DC Servo motor, AC/ DC Tacho generator, Stepper motor and Synchro |
| **UNIT II**Basics of MicroprocessorIntroduction to microprocessor. Advantages and disadvantages of microprocessor control. Structure of microprocessor, Generalized architecture of microprocessor, Functions of each block. Functional block diagram of 8085 microprocessors with pin diagram, logical block diagram of 8085 Microprocessor-Registers, ALU, memory organization, decoder, serial control section, interrupt section, timing and control section. Assembly language Programming of 8085, Addressing Modes, Instruction classification, Instruction formats. Basic Assembly Language programming ( only simple arithmetic operations-addition, subtraction) |  |
| **UNIT III** Basics of Microcontroller 8051Microcontrollers and microprocessors. Pin diagram of 8051 microcontrollers. Internal RAM, ROM and Special Function Registers in 8051chip. I/O ports. Counters and Timers. Interfacing with external memory |  |
| **UNIT IV**Microprocessor and Microcontroller ApplicationsDifferent types of memories: ROM, RAM, PROM, EPROM, EEPROM. Schematic diagram of memory chips decoder, memory interfacing. Memory I/O data transfer scheme for 8255. Interfacing of switches and LEDs. Simple applications of microprocessor and Microcontroller for temperature control of furnace, Traffic light control and SCR firing angle control using microprocessor, Data acquisition system. |  |
| **UNIT V** Programmable Logic Controller and SCADAPLC: CPU, I/O modules, bus system, power supplies and remote I/Os, counter, timer. Different PLC's available in market. Selection of a PLC. SCADA- Concept and Application |

**COMPUTER GRAPHICS**

**(MCA E303)**

**UNIT I:**

 Introduction to Computer Graphics What is Computer Graphics? Application of Computer Graphics, Presentation Graphics Painting and Drawing, Photo Editing, scientific Visualization, Image Processing, Digital Art, Education, training, Entertainment and CAD, S Simulation, Animation and Games. Input and Output Devices, Touch Pane, Light Pens, Graphic Tablets, Plotters, Film Recorders, Display Devices, Refreshing Display Devices, Raster-Scan, Random-Scan, Plasma Panel and LCD panels.

**UNIT II:**

Graphics Primitives Points and Lines, Line-drawing Algorithms, DDA algorithm, Bresenham's line Algorithm, Circle-generating algorithm, Properties of Circles, Midpoint Circle of Algorithm, Polygon Filling Algorithm: Scan-Line. 2-D Viewing and Clipping and 2-D and 3-D Transformations Point Clipping, Line Clipping, Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm, Polygon Clipping: Sutherland Hodgman Algorithm, Windowing Transformation Basic Transformations, Translation, Rotation, Scaling, Shear, Composite Transformations, Rotations about a point, Reflection about a line, Homogeneous Coordinate Systems, 3-D Transformations, Viewing Transformation.

**UNIT III:**

Projections and Modelling & Rendering Curves and Surfaces Parallel Projection, Orthographic & Oblique Projections Isometric Projections, Perspective Projections. Polygon Representation Methods, Polygon Surfaces, Polygon Tables, Plane Equations, Polygon Meshes, Bezier Curves and Surfaces, Bezier Curves, Properties of Bezier Curves, Bezier Surfaces, Surface of Revolution, Visible - Surface Detection, Depth Buffer Method, Scan-Line Method, Area-Subdivision Method.

**UNIT IV:**

Polygon Rendering and Ray Tracing Methods Illumination Model, Ambient Reflection, Diffuse Reflection, Specular Reflection, Shading, Gouraud Shading, Phong Shading, Ray Tracing, Basic Ray-Tracing Algorithm.

**UNIT V:**

Multimedia and Animation Basic of Animation, Types of Animation, Simulating Acceleration, Computer Animation Tools, Applications, Multimedia Concepts and Applications, Concepts of Hypertext/Hypermedia, Multimedia Applications, Education, Video Conferencing, Training, Entertainment, Electronic Encyclopedia.

**Text Book:**

1. Computer Graphics by Amarendra Nath Sinha, Landmark Ltd.

**Reference Books:**

1. Basics of Computer Graphics Design by Niit, Landmark Ltd.
2. Procedural Elements for Computer Graphics by Rogers, David F., Landmark Ltd.
3. Introduction to Computer Graphics by Krishnamurthy, N, Manohar Publishers and Distributors
4. Principles of Interactive Computer Graphics by Newman, William M., Landmark Ltd.
5. Computer Graphics by G.S. Baluja.

**PROBABILITY AND STATISTICS**

**(MCA E304)**

 **Statistics:**

**UNIT I**

Basic Statistics: Frequency Charts -Different Frequency charts; Measures of central tendencies: Mean, Median, Mode; Measures of dispersion: Range, Variance and standard deviational distributions and cumulative frequency distributions, Moments and Moment generating function.

**UNIT II**

Sampling: Theory of sampling; Populations and sample; sampling survey methods and estimation. Statistical Inference; Testing of Hypothesis and inference.

**UNIT III**

Linear correlation coefficient Linear regression; Nonlinear regression; Multiple correlation and multi regression. Regression Analysis: Least Square fit; polynomial and curve fittings;

**UNIT IV**

Time Series and Forecasting: Moving averages, Smoothening of curves Forecasting models and methods, Statistical Quality Control Methods.

**UNIT V**

Factor Analysis ANOVA, Tests of significance: CHI-square test and F test, Application to medicine, psychology, agriculture etc.

**Probability**:

**UNIT VI**

Probability Theory: Sample Spaces; Events & probability; Discrete Probability; Union, intersection and compliments of events; conditional probability; Bayes Theorem.

**UNIT VII**

Random Variables and Distributions: Random variables, Discrete Probability Distributions Binomial, Poisson, Hypergeometric Density functions and Distributions functions; continuous Probability distribution, Uniform, Exponential, Normal, Student’s T,Beta and F static.

**UNIT VIII**

Expectations and higher order moments; characteristic functions. Laws on Large Numbers, weak laws & strong laws of large member’s central limit theorem and other limit theorems. (statements only)

**Text Books:**

1. Mathematical Statistics - Gupta & Kapoor.
2. Probability and Its Applications - Schaum Series.

**MACHINE LEARNING**

**(MCA E305)**

**UNIT I**

Overview and Introduction to Bayes Decision Theory: Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

**UNIT II**

Linear machines: General and linear discriminants, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptron: two-layers universal approximators, backpropagation learning, on-line, off-line error surface, important parameters.

**UNIT III**

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3 algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data

 Instance-based Learning: Nearest neighbour classification, k-nearest neighbour, nearest neighbour error probability

**UNIT IV**

Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoff.

Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting.

**UNIT V**

Support Vector Machines: Margin of a classifier, dual perceptron algorithm, learning nonlinear hypotheses with perceptron kernel functions, implicit non-linear feature space, theory, zero-Bayes, realizable infinite hypothesis class, finite covering, margin-based bounds on risk, maximal margin classifier.

 **Text books**

1. E. Alpaydin, Introduction to Machine Learning, Prentice Hall of India, 2006.
2. T. M. Mitchell, Machine Learning, McGraw-Hill, 1997.
3. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
4. R. O. Duda, P. E. Hart, and D.G. Stork, Pattern Classification, John Wiley and Sons, 2001.
5. Vladimir N. Vapnik, Statistical Learning Theory, John Wiley and Sons, 1998.
6. Shawe-Taylor J. and Cristianini N., Cambridge, Introduction to Support Vector Machines, University Press, 2000.

**ADVANCE DATASTRUCTURE AND ALGORITHM**

**(MCA E306)**

**UNIT I**

LINEAR DATA STRUCTURES Introduction - Abstract Data Types (ADT) – Stack – Queue – Circular Queue - Double Ended Queue - Applications of stack – Evaluating Arithmetic Expressions - Other Applications - Applications of Queue - Linked Lists - Singly Linked List - Circularly Linked List - Doubly Linked lists – Applications of linked list – Polynomial Manipulation.

**UNIT II**

NON-LINEAR TREE STRUCTURES Binary Tree – expression trees – Binary tree traversals – applications of trees – Huffman Algorithm - Binary search tree - Balanced Trees - AVL Tree - B-Tree - Splay Trees – Heap Heap operations- -Binomial Heaps - Fibonacci Heaps- Hash set.

**UNIT III**

GRAPHS Representation of graph - Graph Traversals - Depth-first and breadth-first traversal - Applications of graphs - Topological sort – shortest-path algorithms - Dijkstra‟s algorithm – Bellman-Ford algorithm – Floyd's Algorithm - minimum spanning tree – Prim's and Kruskal's algorithms.

 **UNIT IV**

ALGORITHM DESIGN AND ANALYSIS Algorithm Analysis – Asymptotic Notations - Divide and Conquer – Merge Sort – Quick Sort - Binary Search - Greedy Algorithms – Knapsack Problem – Dynamic Programming – Optimal Binary Search Tree - Warshall‟s Algorithm for Finding Transitive Closure.

**UNIT V**

ADVANCED ALGORITHM DESIGN AND ANALYSIS Backtracking – N-Queen's Problem - Branch and Bound – Assignment Problem - P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman Problem-Amortized Analysis.

**References:**

1. Anany Levitin “Introduction to the Design and Analysis of Algorithms” Pearson Education, 2015
2. E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, 2007
3. E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms/C++”, Second Edition, University Press, 2007
4. Gilles Brassard, “Fundamentals of Algorithms”, Pearson Education 2015
5. Harsh Bhasin, “Algorithms Design and Analysis”, Oxford University Press 2015
6. John R.Hubbard, “Data Structures with Java”, Pearson Education, 2015
7. M. A. Weiss, “Data Structures and Algorithm Analysis in Java”, Pearson Education Asia, 2013 MC5301 / Advanced Data Structures & Algorithms MCA 2018-2019 St. Joseph’s College of Engineering 2
8. Peter Drake, “Data Structures and Algorithms in Java”, Pearson Education 2014
9. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Thrid Edition, PHI Learning Private Ltd, 2012
10. Tanaenbaum A.S.,Langram Y. Augestein M.J, “Data Structures using C” Pearson Education , 2004.

**DOT NET USING C#**

**(MCA E307)**

**UNIT-I**

The .Net framework: Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

**UNIT-II**

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

**UNIT-III**

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

**UNIT-IV**

Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

**UNIT-V**

.Net Assemblies and Attribute: .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

**TEXT BOOKS**

1. Wiley,” Beginning Visual C# 2008”,Wrox
2. Fergal Grimes,” Microsoft .Net for Programmers”. (SPI)
3. Balagurusamy,” Programming with C#”, (TMH)
4. Mark Michaelis, “Essential C# 3.0: For .NET Framework 3.5, 2/e, Pearson Education
5. Shibi Parikkar, “ C# with .Net Frame Work” , Firewall Media.

**CLOUD COMPUTING AND IOT**

**(MCA E308)**

**UNIT I**

Introduction to Cloud Computing - Service Model – Deployment Model- Virtualization Concepts – Cloud Platforms – Amazon AWS – Microsoft Azure – Google APIs.

**UNIT II**

IoT and the Cloud - Role of Cloud Computing in IoT - AWS Components - S3 – Lambda - AWS IoT Core -Connecting a web application to AWS IoT using MQTT- AWS IoT Examples.

Security Concerns, Risk Issues, and Legal Aspects of Cloud Computing- Cloud Data Security

**UNIT III**

Introduction to IoT – IoT definition – Characteristics – IoT Complete Architectural Stack – IoT enabling Technologies – IoT Challenges.

Sensors and Hardware for IoT – Hardware Platforms – Arduino, Raspberry Pi, Node MCU. A Case study with any one of the boards and data acquisition from sensors.

**UNIT IV**

Protocols for IoT – Infrastructure protocol (IPV4/V6/RPL), Identification (URIs), Transport (Wifi, Lifi, BLE), Discovery, Data Protocols, Device Management Protocols. – A Case Study with MQTT/CoAP usage-IoT privacy, security and vulnerability solutions.

**UNIT V**

Case studies with architectural analysis: IoT applications – Smart City – Smart Water – Smart Agriculture – Smart Energy – Smart Healthcare – Smart Transportation – Smart Retail – Smart waste management.

**Text Book:**

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman ,CRC Press.
2. Adrian McEwen, Designing the Internet of Things, Wiley,2013.

**COMPILER DESIGN**

**(MCA E309)**

**UNIT- I**

Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler Programming Languages: High level languages, The lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission. Lexical Analysis: The role of Lexical Analyser, A simple approach to the design of Lexical Analyser, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyser, Lexical Analyser Generator: LEX, Capabilities of Lexical Analyser

**UNIT-II**

The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG. Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR) Syntax Analyser Generator: YACC

**UNIT-III**

Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

**UNIT-IV**

Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table Management Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

**UNIT-V**

 Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyser, Machine Model, Order of evaluation, Register allocation and code selection

References:

1. Alfred V Aho , Jeffrey D. Ullman, “Principles of Compiler Design”, Narosa
2. A.V. Aho, R. Sethi and J.D Ullman, “Compiler: principle, Techniques and Tools”, AW
3. H.C. Holub “Compiler Design in C”, PHI Learning Private Limited, Delhi India..
4. Apple, “Modern Computer Implementation in C: Basic Design”, Cambridge press.

**WIRELESS ADHOC NETWORK**

**(MCA E310)**

**UNIT I**

Introduction: Cellular and ad hoc wireless networks Applications of ad hoc wireless networks Issues in ad hoc wireless networks Ad hoc wireless Internet

**UNIT II**

MAC protocols for Ad Hoc Wireless Networks Introduction Issues in designing a MAC Protocols for Ad Hoc Wireless Networks Design goal for MAC protocols for Ad Hoc Wireless Networks CLASSIFICATION OF MAC Protocols Contention Based Protocols Contention Based Protocols with Reservation Mechanism Contention Based Protocols with Scheduling Mechanism Other MAC protocols

**UNIT III**

Routing Protocols for Ad Hoc Wireless Networks. Introduction Issues in designing a Routing Protocols for Ad Hoc Wireless Networks Classification Routing Protocols Table-Driven Routing Protocols On-Demand Routing Protocols Hybrid Routing Protocols Routing Protocols with efficient Flooding Mechanism

**UNIT IV**

Multicast Routing Protocols for Ad Hoc Wireless Networks Issues in designing a Multicast Protocols for Ad Hoc Wireless Networks Operation of Multicast Routing Protocols Classification Multicast Protocols Tree Based Multicast Routing Protocols Mesh Based Multicast Routing Protocols Energy Efficient Multicasting with quality of service Guarantees Application-Dependent Multicasting Routing

**UNIT V**

Transport Layer and Security Protocols For Ad Hoc Wireless Networks Introduction Issues in designing a Transport Layer Protocols for Ad Hoc Wireless Networks Design goal for Transport Layer protocols for Ad Hoc Wireless Networks CLASSIFICATION OF Transport Layer Protocols TCP over Ad Hoc Wireless Networks Others Transport Layer protocols for Ad Hoc Wireless Networks Security in Ad Hoc Wireless Networks Network Security Requirements Issues and challenges in Security provisioning Network Security Attacks Key Management secure Routing in Ad Hoc Wireless Networks

Quality of Service in Ad Hoc Wireless Networks Introduction Issues and challenges in providing Qos in Ad Hoc Wireless Networks Classification Qos solutions MAC layer solutions Network Layer solutions Qos framework for Ad Hoc Wireless Networks

**Text Books:**

1. Ad Hoc Wireless Networks: Architectures and Protocols By C. Siva Ram Murthy, B.S. Manoj
2. Mobile ad hoc networking. Stefano Basagni, Macro Conti, Sivia Giordano, Ivan Stojmenovic, John Wiley & sons Inc.
3. Ad hoc mobile wireless networks principles, protocols and applications Subir Kumar Sarkar, T G Basavaraju, Puttamadappa, Auerbach publication.
4. Introduction to Wireless and Mobile Systems, 4th Edition Dharma P. Agrawal Qing-An Zeng C

**PARALLEL COMPUTING**

**MCA E311**

**UNIT-I**

Introduction of Parallel Computing, Advantages of Parallel Computing, Solving Problem in Parallel: Temporal Parallelism, Data Parallelism and Their Comparison. Inter Task Dependency and Task Graphs. Structure of Parallel Computers: Pipelined

 **UNIT-II**

Parallel Computers, Array Processors, Shared Memory Multiprocessor, Massage Passing Multiprocessors, MMC Systems, Integer Arithmetic; Cary Look- Ahead, Addition and Carry-Save Addition On Binary Tree, Integer Multiplication and Convolution On Linear Array. Elementary Sorting Algorithms.

**UNIT-III**

Matrix Algorithm: Matrix- Vector Multiplication and Solving Lower Triangular System of Equation On a Linear Array, Matrix, Matrix Multiplication, LU Decomposition, Matrix Inversion, Gaussian Elimination On a Mesh. Graph Algorithms: Mesh Algorithm for Transitive Closure, Connected Component, Shortest Path, Breadth First Search and Minimum Spanning Tree. Mesh of Trees and its Applications Such as Matrix Vectors Multiplication, Convolution and Integer Multiplication

**UNIT-IV**

More Fancier Networks: R-Dimensional Mesh of Trees, Shuffle Trees, Shuffle-Exchange Network, Hypercube, De- Bruijn Network And Butterfly. Some Examples on These Networks, Sorting and FFT On Butterfly. SP Tripathi SK Dwivedi Vipin Saxena Deepa Raj Manoj Kumar Narander Kumar Introduction to Dataflow Computers. Parallelism in Logic Programming. Programming Parallel Computers. Suggested

**Text Book:**

1. Elements of Parallel Processing, V. RajaRaman, Prentice- Hall of India, 1990.
2. Designing effiecent Algorithms on parallel Computers, Mc- Graw Hill International, New York, 1987.
3. Parallel Algorithms, Dhall et,al., Mc-Graw Hill In

**DISTRIBUTED COMPUTING**

**(MCA E312)**

**UNIT-I**

Distributed Operation System: Distributed Computing System Models, Issues in Design of Distributed Operating System, Message Passing, Remote Procedure Calls, Synchronization, Process Management, Distributed File Systems, Introduction to Distributed Data –Bases

**UNIT-II**

Distributed Algorithms: Introduction to Distributed Algorithms, Synchronous and Partial Synchronous Models, Algorithms in General Synchronous Leader Election, Breadth First Search, Shortest Path, Randomized Algorithms

**UNIT-III**

Distributed Consensus with Link and Process Failures. Asynchronous System Model, I/o Automata, Operation of Automata, Complexity Measures, Randomizations, Asynchronous Shared Memory Model, Mutual Exclusion, Resource Allocation, Consensus.

**UNIT-IV**

Asynchronous Network Model, Basic Asynchronous Network Algorithms, Shared Memory Vs Networks. Introduction to Parallel Distributed Processing: General Framework, Methods of Learning.

**Text Book**

1. PK Sinha, Distributed Operating System, PHI, 1997.
2. AS Tanenbaum, Modern Operating System, PHI.
3. Nancy A Lynch, Distributed Algorithms, Morgan Kaufmann Pub. Inc., 1996

**DIGITAL IMAGE PROCESSING**

**(MCA E313)**

**UNIT-I**

Why Digital Images; The Digital Camera; Data Types and 2d Representation of Digital Images; Discrete Sampling Model; Quantisation; Noise Processes; Image Attributes Thresholding and Thresholding Algorithms; Performance Evaluation and ROC Analysis; Connected Components Labelling; Region Growing and Region Adjacency Graph (RAG); Split and Merge Algorithms; Grey Level Transformations; Histogram Equalization; Geometric Transformations; Affine Transformation; Polynomial Warps.

**UNIT-II**

Erode and Dilate as Max and Min Operators On Binary Images; Open, Close, Thinning and Other Transforms; Medial Axis Transform; Introduction to Grey- Level Morphology; Calculation of Region Properties; Moment Features; Boundary Coding; Fourier Descriptors Line Descriptors from Boundary Coding and from Moments.

**UNIT-III**

Linear and Non-Linear Filtering Operations; Image Convolutions; Separable Convolutions SubSampling and Interpolation as Convolution Operations; Alternative Approaches; Edge Enhancement by Differentiation; Effect of Noise, Edge Detection and Canny; Implementation; Edge Detector Performance Evaluation, Image Structure Tensor; Relationship to Image Auto- Correlation; Characterisation and Harris Corner Detector. SP Tripathi SK Dwivedi Vipin Saxena Deepa Raj Manoj Kumar Narander Kumar

**UNIT-IV**

Sub-Pixel Accurracy and Performance Evaluation; Representations of Colour in Digital Images; Colour Metrics; Pixel- Wise (Point) Operations; Colour Invariants and Finlayson Colour Contancy Algorithm similarity and Dissimilarity Matching Metrics; L2 Metric and Relationship to Cross- Correlation; Image Search and Multi- Resolution Algorithms, 2D Object Detection, Recognition, Location

**Text Book:**

1. A.K. Jain, Fundamentals of Digital Image Processing, PHI Publication.
2. E. Charniak, D.
3. M.A. Ahmed, Image Processing, TMH.
4. Earl Gose, Richard, Johnsonbaugh, Pattern Recognition & Image Analysis, PHI.

**SUMILATIION AND MODELLING**

**(MCA E314)**

**UNIT-I:**

Introduction to Modelling and Simulation Nature of Simulation. Systems, Models and Simulation, Continuous and Discrete Systems, system modelling, concept of simulation, Components of a simulation study, Principles used in modelling, Static and Dynamic physical models, Static and Dynamic Mathematical Models Introduction to Static and Dynamic System simulation, Advantage, Disadvantages and pitfalls of Simulation.

**UNIT-II:**

 System Simulation and Continuous System Simulation Types of System Simulation, Monte Carlo Method, Comparison of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital- Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

**UNIT–III:**

System Dynamics & Probability concepts in Simulation Exponential growth and decay models, logistic curves, Generalization of growth models, System dynamics diagrams, Multi segment models, Representation of Time Delays. Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuous Distributed Random Numbers, Rejection Method.

**UNIT-IV:**

Simulation of Queueing Systems and Discrete System Simulation Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events, Generation of arrival patterns, Simulation programming tasks, gathering statistics, measuring occupancy and Utilization, Recording Distributions and Transit times.

**UNIT-V:**

Introduction to Simulation languages and Analysis of Simulation output GPSS: Action times, Succession of events, Choice of paths, Conditional transfers, program control statements. SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements. Estimation methods, Relication of Runs, Batch Means, Regenerative techniques, Time Series Analysis, Spectral Analysis and Autoregressive Processes.

**Text Books**:

1. Seila, Simulation Modelling, Cengage Learning
2. Deo, System Simulation with Digital Computer, PHI Reference Books:
3. Law Simulation Modelling and Analysis, McGraw Hill
4. Severance, “System Modelling & Simulation, Willey Pub

**MOILE COMMUNICATION AND COMPUTING**

**(MCA E315)**

**UNIT I**

Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing

**UNIT II**

Global Systems for Mobile Communication (GSM and Short Service Messages (SMS):GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

**UNIT III**

GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

**UNIT IV**

Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

**UNIT V**

Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunnelling, Cellular IP, Mobile IP with IPv6

**NATURAL LANGUAGE PROCESSING**

**MCA E316**

**UNIT-I**

 Introduction to Natural Language Understanding, Language as Knowledge Base Process, Basic Linguistics, Computers & Natural Language Understanding, Grammar & Parsing-Top Down Parsing, Bottom Up Parsing

**UNIT-II**

Transition Network Grammar, Grammar and Logic Programming, Semantic Interpretation-Semantic and Logical Form, Linking Syntax and Semantics, Ambiguity Resolution

**UNIT-III**

Introduction to Semantic Grammar, Template Matching, Semantically Driven Parsing Techniques Context and World Knowledge, Knowledge Representation and Reasoning

**UNIT-IV**

Local Discourse Context and Reference, Discourse Structure and Understanding Using World Knowledge, Language Learning and Concept Learning

**Text Book:**

1. James Allen, Natural Language Understanding, Pearson Education.
2. Rich & Knight, Artificial Intelligence, TMH.
3. Dan W. Patterson, Artificial Intelligence: A Modern Approach, Pearson Education.
4. Russell Norwig, Artificial Intelligence: A Modern approach, Pearson Education.

**SOFTWARE TESTING**

**(MCA E317)**

**UNIT-I:**

Introduction Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

 **UNIT-II:**

White Box and Black Box Testing White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

**UNIT-III**:

Integration, System, and Acceptance Testing Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution

**UNIT-IV:**

Test Selection & Minimization for Regression Testing Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

**UNIT-V:**

Test Management and Automation Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

 **Text Book:**

1. S. Desikan and G. Ramesh, “Software Testing: Principles and Practices”, Pearson Education.
2. Aditya P. Mathur, “Fundamentals of Software Testing”, Pearson Education.
3. Naik and Tripathy, “Software Testing and Quality Assurance”, Wiley
4. K. K. Aggarwal and Yogesh Singh, “Software Engineering”, New Age International Publication.

**BIG DATA**

**(MCA E318)**

**UNIT** I

 UNDERSTANDING BIG DATA What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data ,credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing analytics ,inter and trans firewall analytics

**UNIT II**

NOSQL DATA MANAGEMENT Introduction to NoSQL , aggregate data models ,aggregates ,key-value and document data models, relationships, graph databases, schema less databases ,materialized views, distribution models ,sharding , master slave replication , peer-peer replication , sharding and replication , consistency , relaxing consistency , version stamps , mapreduce , partitioning and combining , composing map-reduce calculations

**UNIT III**

BASICS OF HADOOP Data format, analysing data with Hadoop, scaling out , Hadoop streaming , Hadoop pipes , design of Hadoop distributed file system (HDFS) , HDFS concepts , Java interface , data flow ,Hadoop I/O , data integrity , compression , serialization , Avro file-based data structures

**UNIT IV**

 MAP REDUCE APPLICATIONS Map Reduce workflows unit tests with MR Unit , test data and local tests – anatomy of Map Reduce job run , classic Map-reduce , YARN , failures in classic Map-reduce and YARN , job scheduling , shuffle and sort , task execution , MapReduce types , input formats , output formats.

**UNIT V**

HADOOP RELATED TOOLS Hbase, data model and implementations, Hbase clients, Hbase examples – praxis. Cassandra ,cassandra data model , cassandra examples , cassandra clients , Hadoop integration. Pig , Grunt , pig data model , Pig Latin , developing and testing Pig Latin scripts. Hive , data types and file formats , HiveQL data definition , HiveQL data manipulation – HiveQL queries

**Text Books:**

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
6. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
7. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010. 8. Alan Gates, "Programming Pig", O'Reilley, 2011.

**NETWORK SECUTITY AND CRYPTOGRAPHY**

 **(MCA E319)**

**UNIT-I**

Introduction to security attacks, services and mechanism, Classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon’s theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

**UNIT-II**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption Fermat’s and Euler’s theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security of RSA

**UNIT-III**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA) Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

**UNIT-IV**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos Electronic mail security: pretty good privacy (PGP), S/MIME.

**UNIT-V**

IP Security: Architecture, Authentication header, encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, transaction (SET) . System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

**Text Book:**

1. William Stallings, “Cryptography and Network Security: Principals and Practice”, Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schiener, “Applied Cryptography”. John Wiley & Sons
4. Bernard Menezes,” Network Security and Cryptography”, Cengage Learning.
5. Atul Kahate, “Cryptography and Network Security”, TMH

**WEB BASED PROGRAMMING**

**(MCA C401)**

**UNIT I**

Internet and WWW: What is Internet? Introduction to internet and its applications, E- mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL), browsers - internet explorer, netscape navigator, opera, firefox, chrome, mozilla. Search engine, web saver - apache, IIS, proxy server, HTTP protocol.

**UNIT II**

HTML and Graphics: HTML Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, Text Level formatting, Block Level formatting, List Tags, Hyperlink tags, Image and Image maps, Table tags, Form Tags, Frame Tags, Executable content tags. Imagemaps: What are Imagemaps? Client-side Imagemaps, Server-side Imagemaps, Using Server-side and Client-side Imagempas together, alternative text for Imagemaps, Tables : Introduction to HTML tables and their structure, The table tags, Frames : Introduction to Frames, Applications, Frames document, The tag, Nesting tag, Placing content in frames with the tag, Targeting named frames, Creating floating frames, Using Hidden frames Forms : Creating Forms, The Top of Form

tag, Named Input fields, input tag, Multiple lines text windows, Dropdown and list boxes, Hidden, Text, Text Area, Password, File Upload, Button, Submit, Reset, Radio, Checkbox, Select, Option, Forms and Scripting, Action Buttons, labelling input files, grouping related fields, Disabled and read-only fields, Form field event handlers, passing form data Style Sheets: What are style sheets? Why are style sheets valuable? Different approaches to style sheets, Using Multiple approaches, linking to style information in separate file, setting up style information, Using the tag, embedded style information, Using

**UNIT III**

Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++ (Increment), -- (Decrement), - (Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ? (Conditional operator), ,(Comma operator), delete, new, this, void Statements : Break, comment, continue, delete, do … while, export, for, for…in, function, if…else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp Document and its associated objects : document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events, Defining Event Handlers

**UNIT IV**

XML: Introduction to XML, Anatomy of an XML, document, Creating XML Documents, Creating XML DTDs, XML Schemas, XSL

PHP: Why PHP and MySQL? Server-side web scripting, Installing PHP, Adding PHP to HTML, Syntax and Variables, Passing information between pages, Strings, Arrays and Array Functions, Numbers, Basic PHP errors / problems.

Advanced PHP and MySQL: PHP/MySQL Functions, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, Type and Type Conversions, E-Mail

Reference :

1. Web Design The complete Reference, Thomas Powell, Tata McGrawHill
2. HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
3. JavaScript 2.0 : The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider

PHP : The Complete Reference By Steven Holzner