

Programme Project Report (PPR)

(Master of Computer Application)

- a. Programme's mission & objectives:** The objective of this programme is to equip the learner with the latest tools and techniques of computing and informatics. The course is designed to meet the growing demand for qualified professionals in the field of Information Technology. It helps the learners to acquire the knowledge required for the positions of system analysts, systems designers, programmers and managers in any field related to Computing & Informatics. This 2-year course covers subjects like Programming Languages, Mathematics and Accounting, which provide in-depth understanding to students about concepts like IT tools and applications. MCA from distance education trains you in fields like system designing, system administration, computer networks, data mining, warehousing, enterprise resource planning, application software development, web designing and so on. The programme, therefore, aims at imparting comprehensive knowledge of the subject with equal emphasis on theory and practice. It also aims at the understanding of the fundamentals of computing among the students so that they can compete in the present-day global situation.
- b. Relevance of the program with HEIs Mission and Goals:** One of the important aims of higher education is the training for leadership in the profession and public life. Master of Computer Applications (MCA) is a two-year (four semesters) professional Master's Degree in computer science which is inclined more toward application development and thus has more emphasis on latest programming language and tools to develop better and faster applications. It prepares students to take up positions as system analysts, systems designers, programmers and managers in any field related to information technology. As the IT and the software industry are dynamic and fast growing, all the programmes are designed keeping in view the requirements of industry.
- c. Nature of prospective target group of learners:** The students who wish to join an MCA program is required to have:
Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree like PGDCA diploma from UGC recognised University, A- Level from DOEACC with graduation, etc. Or
B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level (obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination), they have to complete 2 semester PDGCA program offered by Uttarakhand Open University as a bridge course. After the completion of the bridge course, the PGDCA diploma shall be awarded to these candidates and they will be admitted to first semester of two-year (four semester) MCA program. For candidates who do not have Mathematics at 10+2 Level or at Graduation level, they have to enrol and complete an additional Mathematic course available at SWAYAM portal (Sr. Secondary Mathematics paper in SWAYAM portal by Dr. Rajendra

Kumar Nayak, NIOS). The equivalent courses shall be identified from time to time and the details shall be provided in the University website.

d. Appropriateness of programme to be conducted in Open and Distance Learning mode to acquire specific skills and competence: The Open and Distance Learning (ODL) University system is more learner-oriented where of the instruction is imparted through distance mode with only a small component of face-to-face communication. The University follows the Credit System for its programmes. Each credit is worth 30 and the student has to be an active participant in the teaching-learning process. Most hours of student study time, comprising all the learning activities. Thus, a four-credit course involves 120 study hours. This helps the student to understand the academic effort one has to put into successfully complete a course. Completion of the programme requires successful completion of both assignments and the Term-End Examination of each course along with practical examination of practical oriented courses of the programme. The specially designed printed Self Learning Material for different subject along with other support material is provided to the learners through post/ study center. The study material can also be downloaded through the Universities' e- repository. The University follows a multi-channel approach for the delivery of instruction. It comprises a suitable mix of:

- self-instructional printed material
- audio / video cassettes and CDs
- audio-video programmes transmitted through Hello Haldwani FM Radio and EduSat, and at study centre.
- MOOCs offered through SWAYAM and Institutional LMS.
- D2H
- face-to-face counselling at study centres by academic counselors
- reference library at study centre
- web based academic support
- assignments
- practical

The practical sessions are held in the computer centres / labs of the Study Centres. In these computer labs, the participants have the facility to use the computer and software packages relevant to the syllabus.

- e. **Instructional Design:** Open and Distance learning (ODL) is an innovative approach of providing opportunity of learning through Self Learning Material (SLM) and certain other strategies in a flexible manner at the pace of learners. In this mode, the learner is also provided academic support in the form of counseling and audio/video material in addition to SLM. The University follows the Credit System for its programmes. The MCA programme is of 80 credits and each credit is worth 30 hours of student study time, comprising all the learning activities. Thus, a four-credit course involves 120 study hours. This helps the student to understand the academic effort one has to put into successfully complete a course.
- f. **Procedure for admissions, curriculum transaction and evaluation:** Admission is based on entrance test. The syllabus of the entrance examination is shared with the learners. Admission to MCA program is offered to the learners who had cleared entrance examination and fulfill the minimum eligibility criteria approved by AICTE. This programme has been designed with a semester approach in mind. The first year courses are focused on core courses providing conceptual framework and the second year provides the specialization and the project work. The total numbers of courses in this MCA programme are 19 (including practical courses and project) and the total number of credits is 80. Evaluation for each course covers two aspects:
- Continuous evaluation through Assignment with a weightage of 30%.
 - Term-end examination with a weightage of 70%.

To fulfill the requirements for acquiring the MCA, a student may clear all the courses in a minimum of two years and a maximum of 4 years. In case the student is unable to pass all the courses of the MCA programme in 4 years, s/he can continue for another two years by seeking Re-admission to the courses which s/he is unable to successfully complete. Completion of the programme requires successful completion of both assignment component and the Term-end Examination component for each course in the programme. The term-end examination of the practical courses consists of several sections. Each section is evaluated separately. The viva-voce for each section will also be separate. The 60% marks of the practical exam are for practical questions and remaining 40% for viva-voce. A student needs to obtain a minimum of 40% in each section of the term-end practical examination for successful completion of that particular section. In case a student does not secure the minimum passing marks in a section, s/he needs to appear for the term-end practical examination again for that section only.

- g. **Requirement of the laboratory support and Library Resources:** The practical sessions are held in the computer centres / labs of the Study Centres. Learners can also use Virtual Labs to implement the programs. In these computer labs, the participants will have the facility to use the computer and software packages relevant to the syllabus. The SLM, supplementary text audio and video material of the various courses of the program is available through the e-repository of the University. The University also

have a subscription of National Digital Library to provide the learners' with the ability to enhance access to information and knowledge of various courses of the programme.

- h. Cost estimate of the programme and the provisions:** It is proposed to develop the course material using OER materials available under open licenses. Moreover, course from MCA(3 Year programs) are also available, which will be suitably adapted with respect to program/course outcome/s. This can be performed by the internal faculty members. Therefore, the cost of writing and editing the course is not required. However, for expert committee meeting, BOS meeting, etc Rs. 5,00,000/- is required for the development of the course structure and syllabus of the program.
- i. Quality assurance mechanism and expected programme outcomes:** The program structure is developed under the guidance of the expert committee and Board of studies of the School based on the model curriculum of the programme recommended by AICTE. The program structure and syllabus is approved by the Academic Council of the University. The course structure and syllabus is reviewed according to the needs of the IT Industry every five years.

Programme Outcomes

MCA programme has been designed to prepare graduates for attaining the following program outcomes. After completion of the programme, the students are able to:

1. Computational Knowledge - Apply knowledge of computing, Mathematics, Principles of Accounting, Management and Fundamentals of Software Engineering appropriate to the discipline.
2. Problem Analysis – Identify and analyze problems and formulate the requirements appropriate to its solution.
3. Design Development of Solutions – Design, implement and evaluate a computer based system to meet the desired needs.
4. Conduct Investigations of Complex Computing Problems – Conduct investigations and experiments to analyze and interpret data of complex applications to find valid solutions.
5. Modern Tool Usage – Select and apply current trends, techniques and modern tools that suit the computing requirements like UML diagrams.
6. Professional Ethics - Understand professional, ethical, security and social issues, work with appropriate societal and environmental considerations
7. Lifelong learning - Build up the passion for continuing professional development.
8. Project Management and Finance - Incorporate scientific, financial and management principles for the development of feasible projects.
9. Communication Efficacy - Communicate effectively across multidisciplinary teams to accomplish a common goal.

10. Societal and Environmental concern - Develop systems that meets the desired solutions considering societal and environmental factors.
11. Individual and Team work -Work individually and in teams for the fulfilment of the desired task.
12. Innovation and Entrepreneurship - Create a culture that focus on Innovation and Entrepreneurship.

APPENDIX I

Program Structure of Master of Computer Applications (MCA-21)

- 1. Title of Programme:** Master of Computer Applications
- 2. Programme Code:** MCA-21
- 3. Programme Mode:** Semester
- 4. Admission Cycle:** Twice every Year in Jan. And July
- 5. Eligibility:** Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree like PGDCA diploma from UGC recognised University, A- Level from DOEACC with graduation, etc. Or
B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level (obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination), they have to complete 2 semester PDGCA program offered by Uttarakhand Open University as a bridge course. After the completion of the bridge course, the PGDCA diploma shall be awarded to these candidates and they will be admitted to first semester of two-year (four semester) MCA program. For candidates who do not have Mathematics at 10+2 Level or at Graduation level, they have to enrol and complete an additional Mathematic course available at SWAYAM portal (Sr. Secondary Mathematics paper in SWAYAM portal by Dr. Rajendra Kumar Nayak, NIOS). The equivalent courses shall be identified from time to time and the details shall be provided in the University website.
- 6. SLM Availability Medium:** English
- 7. Duration:**
Min: 2 Years
Max: 4 Years
- 8. Total Credit:** 80

9. Objective of the Programme: The objective of this programme is to equip the learner with the latest tools and techniques of computing and informatics. The professionals who could develop solutions making use of computer applications is the crux of this programme. It helps the learners to acquire the knowledge required for the positions of system analysts, systems designers, Programmers and managers in any field related to Computing & Informatics. The programme, therefore, aims at imparting comprehensive knowledge with equal emphasis on theory and practice

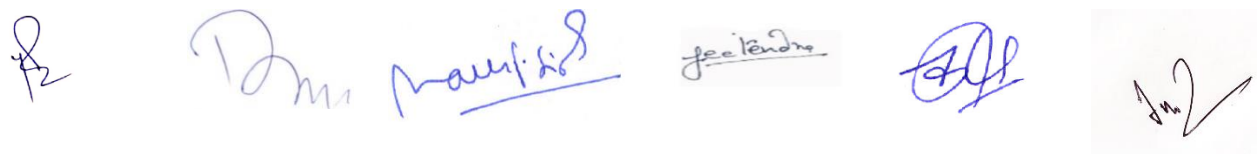
10. Programme Structure: The program structure of the MCA program is as follows:

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10. Programme Structure: The program structure of the MCA program is as follows:



Programme Name & Abbreviation	Programme Code	Eligibility	Duration In Years		SLM	Mode of Exam (Annual/ Sem)	Year / Sem	Details of Fees (Rs.)							
			Min	Max				Programme	Project/ Lab Workshop	Exam	Practical	Viva- Voce	Miscellaneous	Degree Fee	Grand Total
MASTER OF COMPUTER APPLICATIONS – MCA-21	MCA-21	Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree like PGDCA diploma from UGC recognised University, A- Level from DOEACC with graduation, etc. OR B.Sc./ B.Com./ B.A. with Mathematics at 10+2 Level or at Graduation Level (obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination), they have to complete 2 semester PDGCA program offered by Uttarakhand Open University as a bridge course. After the completion of the bridge course, the PGDCA diploma shall be awarded to these candidates and they will be admitted to first semester of two-year (four semester) MCA program. For candidates who do not have Mathematics at 10+2 Level or at Graduation level, they have to enrol and complete an additional Mathematic course available at SWAYAM portal (Sr. Secondary Mathematics paper in SWAYAM portal by Dr. Rajendra Kumar Nayak, NIOS). The equivalent courses shall be identified from time to time and the details shall be provided in the University website.	2	4	English	Sem	I	9500	-	1000	500	-	150		11150
							II	9500	-	1000	500	-	-		11000
							III	9500	-	1000	500	-	-		11000
							IV	9500	1000	750		-	-	300	11550
<div>Dr. Rajendra Kumar Nayak</div>															

Course Structure of 2-year MCA program

Program Code: MCA-21

Total Credits: 80

SEMESTER I			
MCS-501	Discrete Mathematics	04	100 (70/30)
MCS-502	Object-Oriented Programming through C++	04	100 (70/30)
MCS-503	Software Engineering	04	100 (70/30)
MCS-504	Operating System	04	100 (70/30)
MCS-P1	Practical	04	100
SEMESTER II			
MCS-505	Database Management System	04	100 (70/30)
MCS-506	Introduction to Computer Networks	04	100 (70/30)
MCS-507	Design and Analysis of Algorithm	04	100 (70/30)
MCS-508	Programming in Java	04	100 (70/30)
MCS-P2	Practical	04	100
SEMESTER III			
MCS-601	Information Security Assurance: Framework, Standards & Industry Best Practices	04	100 (70/30)
MCS-602	Computer System Architecture	04	100 (70/30)
	Elective I	04	100 (70/30)
	Elective II	04	100 (70/30)
MCS-P3	Practical	04	100 (70/30)
SEMESTER IV			
MCS-604	Introduction to Mobile Architecture	04	100 (70/30)
	Elective III	04	100 (70/30)
	Elective IV	04	100 (70/30)
MCS-603	Project (200 marks) + Viva-Voce(100 marks)	08	300

Elective I

1. Web Technology(MCS-E1)
2. Introduction to Soft Computing(MCS-E2) (Offered through SWAYAM only)
3. Fuzzy Logic and Neural Networks(MCS-E3) (Offered through SWAYAM only)
4. Basics of Remote Sensing and GIS(MCS-E4)

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Elective II

1. Fundamentals of Information Security (MIT(CS)-101)
2. Cyber Security Techniques (MIT(CS)-102)
3. Information System (MIT(CS)-104)
4. Digital Forensics (MIT(CS)-202)

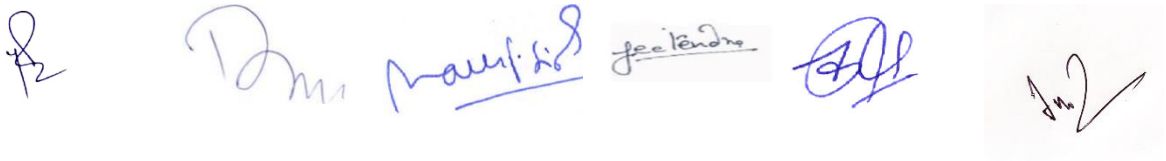
Elective III

1. Formal Languages and Automata(MCS-E5)
2. Python Programming(MCS-E6) (Offered through SWAYAM only)
3. Artificial Intelligence(MCS-E7) (Offered through SWAYAM only)
4. Data Science for Engineers(MCS-E8) (Offered through SWAYAM only)

Elective IV

1. Information System for Business (MCA-E8)
2. Project Management (MCA-E9)
3. Wireless Networks (MCA-E10)
4. Introduction to Internet of Things (MCA-E11) (Offered through SWAYAM only)
5. Cloud Computing (MCA-E12) (Offered through SWAYAM only)

Note: Processing fee of Rs.250/course shall be applicable to facilitate credit transfer along with the application form and transcripts.

The bottom of the page features several handwritten signatures and a stamp. From left to right, there is a signature that appears to be 'R2', a large signature 'Dm. Manish', a rectangular stamp with the text 'Jee Kano', another signature, and a final signature on the right.

Course Outcomes

SEMESTER I				
MCS-501	Discrete Mathematics			04 Core
Course Outcomes	1.	Ability to apply mathematical logic to solve problems.		
	2.	Understand sets, relations, functions and discrete structures.		
	3.	Able to use logical notations to define and reason about fundamental mathematical concepts such as sets relations and functions.		
	4.	Able to formulate problems and solve recurrence relations.		
	5.	Able to model and solve real world problems using graphs and trees.		
MCS-502	Object-Oriented Programming through C++			04 Core
Course Outcomes	1.	Design the classes needed, given a problem specification.		
	2.	Implement the designed classes using the object-oriented programming language.		
	3.	Learn how to test, verify, and debug object-oriented programs and create programs using object-oriented principles.		
MCS-503	Software Engineering			04 Core
Course Outcomes	1.	Learn the theory and foundations of software engineering.		
	2.	Learn the different process models and choose the best model for their project		
	3.	Be able to construct requirement models		
	4.	Be able to Understand the different development practices and its advantages		
	5.	Be able to create test cases and implement different testing strategies		
	6.	Understand the environment and work culture in a software organization		
MCS-504	Operating System			04 Core
Course Outcomes	1.	The students will understand Operating System concepts and design Operating Systems.		
	2.	Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.		
	3.	Analyze important algorithms eg. Process scheduling and memory management algorithms.		
	4.	Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques.		

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MCS-P1	Practical		04	Practical
Course Outcomes	1.	Introduces Object Oriented Programming concepts using the C++ language.		
	2.	Understanding the principles of data abstraction, inheritance and polymorphism combinations.		
	3.	Apply the principles of virtual functions and polymorphism.		
	4.	Analyzing the handling formatted I/O and unformatted.		
	5.	Evaluate the I/O Introduces exception handling.		
SEMESTER II				
MCS-505	Database Management System		04	Core
Course Outcomes	1.	Understand the fundamentals of relational, object-oriented, and distributed database systemsincluding: data models, database architectures, and database manipulations.		
	2.	Understand the theories and techniques in developing database applications and be able todemonstrate the ability to build databases.		
MCS-506	Introduction to Computer Networks		04	Core
Course Outcomes	1.	The students will gain proficiency in various network protocols and models.		
	2.	Recognize the technological trends of Computer Networking.		
	3.	Discuss the key technological components of the Network.		
	4.	Evaluate the challenges in building networks and solutions to those		
MCS-507	Design and Analysis of Algorithm		04	Core
Course Outcomes	1.	Argue the correctness of algorithms using inductive proofs and Analyze worst-case running times of algorithms using asymptotic analysis.		
	2.	Explain important algorithmic design paradigms (divide-and-conquer, greedy method, dynamic-programming and Backtracking) and apply when an algorithmic design situation calls for it.		
	3.	Explain the major graph algorithms and Employ graphs to model engineering problems, when appropriate.		
	4.	Compare between different data structures and pick an appropriate data structure for a design situation.		
	5.	Describe the classes P, NP, and NP- Complete and be able to prove that a certain problem is NP-Complete.		
	6.	Analyze String matching algorithms.		
MCS-508	Programming in Java		04	Core
Course Outcomes	1.	Apply the knowledge of JAVA language syntax and semantics to write and execute Java programs.		

	<ol style="list-style-type: none"> Analyze the different aspects of a specific problem and design Java programs based on object oriented principles like classes, objects, constructors and inheritance. Using the concept of applets and event handling develop GUI interfaces for a computer program to interact with users and to implement the event based GUI handling principles. Identify various erroneous conditions in the system and implement the merits of exception handling techniques to make the system bug free. Design Java programs to design a system to meet industrial needs and to solve real world problems based on client-server communication. 		
MCS-P2	Practical	04	Practical
Course Outcomes	<ol style="list-style-type: none"> Understand, appreciate and effectively explain the underlying concepts of database technologies. Design and implement a database schema for a given problem-domain. Normalize a database. Populate and query a database using SQL DML/DDL commands. Use any popular RDBMS for data access and updating. Design the classes needed, given a problem specification. Implement the designed classes using the object oriented programming language. Learn how to test, verify, and debug object-oriented programs and create programs using object oriented principles. 		
SEMESTER III			
MCS-601	Information Security Assurance: Framework, Standards & Industry Best Practices	04	Core
Course Outcomes	<ol style="list-style-type: none"> Distinguishing among the main security goals (confidentiality, integrity, and availability). Interpreting the authenticity and accountability security goals. Applying the generally accepted security principles. Comparing various cryptographic algorithms. Assessing key distribution and management techniques. Employing various models of access control. Distinguishing between unethical and illegal behavior in information security. Identifying major national laws that relate to the practice of information security. Discussing legal, ethical, and professional issues in information security. 		
MCS-602	Computer System Architecture	04	Core
Course Outcomes	<ol style="list-style-type: none"> Know about the basic functioning of various parts of computer system from hardware point of view and interfacing of various peripheral devices used with the system. 		

	<ol style="list-style-type: none"> Learn number system and various types of micro-operations of processor. Learn the communication of various components through common bus. Learn how to design Combinational & Sequential circuits. Understand the basics of instructions sets and their impact on processor design. Demonstrate an understanding of the design of the functional units of a digital computer system. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory. Design a pipeline for consistent execution of instructions with minimum hazards. 		
	Elective I	04	Elective
	Elective II	04	Elective
MCS-P3	Practical	04	Practical
Course Outcomes	<ol style="list-style-type: none"> Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. Express proficiency in the handling of strings and functions. Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. Identify the commonly used operations involving file systems and regular expressions. Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python. 		
SEMESTER IV			
MCS-604	Introduction to Mobile Architecture	04	Core
Course Outcomes	<ol style="list-style-type: none"> Understand key concepts of mobile app development. Know the opportunities and challenges of mobile apps. Know the details of PC based apps as well as web based apps, content and key protocols of mobile apps, evolution of mobile apps. Comparison of mobile apps and web apps and upcoming trends in mobility space. Know about architecture of a Mobile OS, Mobile Operating Systems; and existing and discontinued Mobile Operating Systems. Know about ARM processors, x86 processors. Understand key concepts of Android Studio and Eclipse IDE for Android. Understand concepts of Xcode IDE and Swift programming language for iOS apps Development. 		
	Elective III	04	Elective

Elective IV		04	Elective
MCS-603	Project (200 marks) + Viva-Voce(100 marks)	08	300
Course Outcomes	To provide the hands on experience in analyzing, designing and implementing various projects, students are assigned major projects based on the languages they have learned so far. Based on the project work a project report should be prepared under the guidance of faculty and submitted to department for evaluation		

Elective I

1. Web Technology(MCS-E1)

Course Outcomes

- Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, VBScript, ASP, PHP and protocols in the workings of the web and web applications
- Analyze a web project and identify its elements and attributes in comparison to traditional projects.
- Create web pages using HTML, DHTML and Cascading Styles sheets.
- Analyze and build interactive web applications using ASP and ASP.NET.
- Build web applications using PHP, XML documents and XML Schema, and consume web services.

2. Introduction to Soft Computing(MCS-E2) (Offered through SWAYAM only)

Course Outcomes

3. Fuzzy Logic and Neural Networks(MCS-E3) (Offered through SWAYAM only)
4. Basics of Remote Sensing and GIS(MCS-E4)

Elective II

1. Fundamentals of Information Security (MIT(CS)-101)
2. Cyber Security Techniques (MIT(CS)-102)
3. Information System (MIT(CS)-104)
4. Digital Forensics (MIT(CS)-202)

Elective III

1. Formal Languages and Automata(MCS-E5)

Course Outcomes

- Understand the basic concepts of formal languages, automata and grammar types, as well as the use of formal languages and reduction in normal forms.
- Demonstrate the relation between regular expressions, automata, languages and grammar with formal mathematical methods.
- Design push down automata, cellular automata and Turing machines performing tasks of moderate Complexity.
- Analyse the syntax and formal properties, parsing of various grammars such as LL(k) and LR(k).
- Describe the rewriting systems and derivation languages.

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2. Python Programming(MCS-E6) (Offered through SWAYAM only)
3. Artificial Intelligence(MCS-E7) (Offered through SWAYAM only)
4. Data Science for Engineers(MCS-E8) (Offered through SWAYAM only)

Elective IV

1. Information System for Business (MCA-E8)

Course Outcomes

- Relate the basic concepts and technologies used in the field of management information systems;
- Compare the processes of developing and implementing information systems.
- Outline the role of the ethical, social, and security issues of information systems.
- Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
- Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.

2. Project Management (MCA-E9)

Course Outcomes

- Understand project characteristics and various stages of a project.
- Understand the conceptual clarity about project organization and feasibility analyses Market, Technical, Financial and Economic.
- Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.
- Apply the risk management plan and analyse the role of stakeholders.
- Understand the contract management, Project Procurement, Service level Agreements and productivity.
- Understand the How Subcontract Administration and Control are practiced in the Industry.

3. Wireless Networks (MCA-E10)

Course Outcomes

- Keep updated on latest wireless technologies and trends in the communication field.
- Understand the transmission of voice and data through various networks.

4. Introduction to Internet of Things (MCA-E11) (Offered through SWAYAM only)

5. Cloud Computing (MCA-E12) (Offered through SWAYAM only)

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Syllabus

Discreet Mathematics

MCS-501

Block-I

Unit I

Set Theory, Definition of Sets Notations; Types of Sets, Relation between Sets, Operations on Sets, Venn Diagrams: Definition, Complements, Cartesian Product, Power Sets Counting Principles: Product Rule, Sum Rule, Subtraction Rule, Division Rule; Cardinality Countability: Countable sets, Uncountable Sets, Basic Set Identities & proofs, Pigeonhole Principle

Unit II

Relation, Definition of Relation: Notations; Types of Relations: Inverse relation, Combined relation, Composition of Relation, Domain & Range, Pictorial Representation: Matrix, Arrow Diagram Directed Graph; Properties of Relation: Reflexive, Symmetric, Transitive, Irreflexive, Antisymmetric, Partial Ordering.

Unit III

Function, Definition, Classification, Types of Function: Into, Onto, One-one, many-one, One-one into, One-one onto, Many one into, Many one onto, Identity, Constant, Composition of Function, Recursively Defined Function

Unit IV

Propositional Logic, Propositions: Elements of Propositions, Propositional Variable; Basic Logic: Logical Connectives, Truth Tables; Tautologies, Contradiction, Normal Forms: Elementary Product, Elementary Sum, Conjunctive, Disjunctive, Principal Disjunctive Normal Form, Principal Conjunctive Normal Form.

Block-2

Unit-I

Inference, Rules of Inference, Modus Ponens, Modus Tollens: Formal Notation, Relation with modus tollens; Validity: Validity of an argument, Validity of a statement; Predicate Logic, Quantification: Universal Quantification, Existential Quantification.

Unit-II

Notion of proof, Proof by implication, Converse, Inverse, Contrapositive, Negation, Contradiction Direct proof, Proof by truth table: Proof of tautology, Proof by counter example.

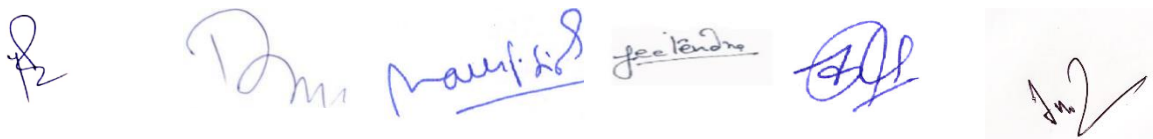
Unit-III

Combinatorics, Mathematical induction: Principle of strong mathematical induction, Recursive Mathematical definitions: Recursively defined Functions, Recursively defined Sets; Basics of counting: Sum Rule, Product Rule, Counting ways of forming numbers from a set of digits, Inclusion – Exclusion principle, Permutations and Combinations

Unit-IV

Recurrence Relation, Definition, Modeling with Recurrence Relations, Order and degree of Recurrence Relations, Linear homogenous Recurrence Relations: Solving linear homogeneous recurrence relations with constant coefficients, Solving linear non-homogeneous recurrence relations with constant coefficients.

Block-3



Unit-I

Generating function, Closed form expression: Definition of Generating Function, Some special generating function; Properties of Generating Function, Solution of Recurrence Relation using Generating Function, Solution of combinatorial problem using Generating Function.

Unit-II

Algebraic Structure, Introduction, Binary Composition & its properties: Closure Law, Associative Law, Existence of identity element, Existence of Inverse element, Commutative Law; Definition of algebraic structure.

Group, Overview: Definition, Abelian Group, Properties of Group, Groups; Monoid Groups.

Unit-III

Generating function, Sub Groups: Cosets, Index of subgroup, Centralizer and Normalizer, Order of a group Lagrange's Theorem; Cyclic Group, Permutation Group: Equality of two permutations, Identity permutation, Product of permutation, Inverse permutation, Cyclic Permutation; Rings: Commutative ring, Ring & unity, Zero divisor of a ring, Subrings, Ring Homomorphism, Integral Domain, Division Ring (Skew Field); Fields.

Block-4

Unit-I

Graph Theory, Basic Terminology, Types of Graph: Simple Graph, Multi-graph, Trivial Graph and Null Graph, Pseudo-graph, Complete Graph, Regular Graph, Bipartite Graph, Platonic Graph, Weighted Graph Connected Graphs; Connected Graph & its Components, Euler graph, Hamiltonian path and circuits, Graph coloring & Chromatic number.

Unit-II

Trees, Definition, Types of tree: Rooted, Binary; Properties of trees, binary search tree, Tree traversing.

Unit-III

Finite Automata, Basic Concept of Automation theory: Alphabet & Words, Language, Grammars: Types of Grammars, Chomsky Hierarchy; Deterministic Finite Automation (DFA): Transition Function, Transition Table; Non Deterministic Finite Automata, Minimization of finite Automation, Mealy, Moore Machine

Suggested Reading:

Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.

J.P.Tremblay & R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science" Mc.Graw Hill, 1975.

V. Krishnamurthy, "Combinatorics: Theory and Applications", East-West Press.

Seymour Lipschutz, M.Lipson, "Discrete Mathematics" Tata McGraw Hill, 2005.

Kolman, Busby Ross, "Discrete Mathematical Structures", Prentice Hall International.

Object-Oriented Programming through C++

MCS-502

BLOCK - 1

UNIT 1: Principles of object oriented programming

Object oriented programming paradigm, Comparison with procedural programming, Basic concepts of object oriented programming, benefits of OOP, object oriented Languages, advantage of C++.

UNIT 2: Object Orient Programming System

Class, inheritance, abstraction, encapsulation and information hiding, polymorphism, overloading.

UNIT 3: Advanced concept

Dynamism (Dynamic typing., dynamic binding, late binding, dynamic loading). Structuring programs, reusability, organizing object oriented project,

BLOCK - 2

UNIT 5: Overview of C++

Tokens, keywords, identifiers and constants basic data types, user-defined and derived Data types, type compatibility, reference, variables type Casting, operator precedence, control structures, structure, function.

UNIT 6: Classes and objects

Class specification, class objects, accessing class members, scope resolution operator, data hiding, empty classes, Pointers within a class, passing objects as arguments, returning objects from functions, friend Functions and friend classes, constant parameters and member functions, structures and Classes, static members.

UNIT 7: Object initialization and cleanup

Constructors destructor, constructor overloading. order of construction and destruction, Constructors with default arguments, nameless objects, dynamic initialization through Constructors, constructors with dynamic operations, constant objects and constructor, static Data members with constructors and destructors, nested classes.

BLOCK - 3

UNIT 8: Operator overloading and type conversion

Defining operator overloading, overloading unary operators, overloading binary operators, overloading binary operators using friends, manipulation of strings using Operators, rules for overloading operators. type conversions.

UNIT 9: Inheritance: extending classes

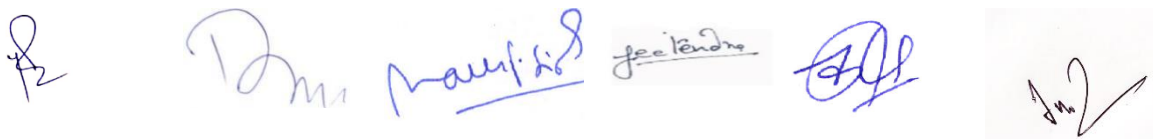
Deriving derived classes, single multilevel, multiple, hierarchical, hybrid inheritance, Constructors & destructors in derived classes, constructors invocation and data members Initialization, virtual base classes, abstract classes, delegation.

BLOCK- 4

UNIT 10: Pointers, virtual functions and polymorphism

Pointers to objects, this pointer. pointers to derived classes, virtual functions, Implementation of run-time polymorphism, pure virtual functions.

UNIT 11: Working with files

A row of handwritten signatures and initials in blue ink. From left to right: a stylized 'R', 'Dm', 'mauricio', 'jocelino', a circular signature, and 'Am2'.

Classes for file stream operations. opening and closing a file, file pointers and their Manipulations, sequential input and output operations, error handling during file Operations, command line arguments.

UNIT 12: Object Oriented Modeling

Need of object oriented Modeling, Simulation of real life problems using OOP concept: Example, Representation of problem using object and class diagrams at design level.

P2

Dr. Manish

jeetendra

all

Am2

Software Engineering

MCS- 503

Block I

Unit I: Introduction to software engineering

1.1 Basic issues in software engineering

1.2 Structured programming

Unit II: Software life cycle model

2.1 Basics of software life cycle and waterfall model

2.2 Prototyping and spiral life cycle models

Unit III: Requirements analysis and specification

3.1 Basic concepts in requirement analysis and specification

3.2 Formal requirement specification

3.3 Algebraic specification

Unit IV: Software design issues

4.1 Basic concepts in software design

4.2 An overview of current design approaches

Block II

Unit V: Function-oriented software design

5.1 Data flow diagrams

5.2 DFD model of a system

Unit VI: Basic concepts in object creation

6.1 Structured design

Unit VII: Object modeling using UML

7.1 Basic ideas on UML

7.2 Use case model

7.3 Class and interaction diagrams

7.4 Activity and state chart diagram

Unit VIII: Object oriented software development

8.1 Design Patterns

8.2 Domain Modeling

Unit IX: User interface design

9.1 Basic Concepts in User Interface Design

9.2 Types of User Interfaces

9.3 Component-Based GUI Development

Block III

Unit X: Coding and testing

10.1 Code Review

10.2 Black-Box Testing

10.3 White-Box Testing

10.4 Debugging, Integration and System Testing

Unit XI: Software project planning

11.1 Project Planning and Project Estimation Techniques

11.2 COCOMO Model

11.3 Staffing Level Estimation and Scheduling

Unit XII: Software project monitoring and control

12.1 Organization and Team Structures

12.2 Risk Management and Software Configuration Management

Unit XIII: Software reliability and quality management

13.1 Software Reliability Issues

13.2 Statistical Testing and Software Quality Management

13.3 ISO 9000

13.4 SEI CMM

Block IV

Unit XIV: Software maintenance

14.1 Characteristics of Software Maintenance

Unit XV: Computer aided software engineering

15.1 Basic ideas on CASE Tools

15.2 Different Characteristics of CASE Tools

Unit XVI: Software Reuse

16.1 Basic ideas on Software Reuse

16.2 Reuse Approach

Unit XVII: Client server software development

17.1 Basic Ideas on Client-Server Software Development and Client-Server Architecture

17.2 CORBA and COM/DCOM.

Suggested Reading:

1. Pressman: Software Engineering, Tata McGraw Hill.
2. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.
3. Fairley, R.E.: Software Engineering Concepts, McGraw-Hill.
4. Lewis, T.G.: Software Engineering, McGraw-Hill.
5. Mall, Rajib: Fundamental of Software Engineering, Third Edition, PHI
6. Ghezzi, Carlo: Fundaments of Software Engineering, PHI.
7. Shere: Software Engineering & Management, Prentice Hall.

Operating System

MCS- 504

Block-1

Unit I

Introduction to Operating system, User and System View, The Evolution, Operational View, Processes and Tools, Trends in Computing, Parallel Computing, Real - Time Systems, Wireless Systems.

Unit II

File Systems and Management, What Are Files?, File Types and Operations, File Access Rights, File Access and Security Concerns, File Storage Management, Inode in Unix, File Control Blocks, The Root File System, Block-based File Organization, Policies In Practice, Disk Partitions, Portable storage

Unit III

Introduction to Processes and Process management, What is a Process, Main Memory Management, Files and IO Management, Process Management, Processor Utilization, Response Time, Process States, A Queuing Model, Scheduling, Choosing a Policy, Policy Selection, Comparison of Policies, Pre-emptive Policies, How to Estimate Completion Time, Exponential Averaging Technique, Multiple Queues Schedules, Two Level Schedules, Kernel Architecture, System Calls, Layered Design, The Virtual Machine Concept, System Generation, Linux: An Introduction, The Linux Distribution, Linux Design Considerations, Components of Linux.

Unit IV

Introduction to Memory management , Main Memory Management, Memory Relocation

Concept, Compiler Generated Bindings, Linking and Loading Concepts, Process and Main Memory Management, The First Fit Policy: Memory Allocation, The Best Fit Policy: Memory Allocation, Fixed and Variable Partitions, Virtual Storage Space and Main Memory Partitions, Virtual Memory: Paging, Mapping the Pages, Paging: Implementation, Paging: Replacement, Page Replacement Policy, Thrashing, Paging: HW support, The TLB scheme, Some Additional Points, Segmentation.

Block II

Unit V

Introduction to Input Output (IO) Management, Issues in IO Management, Managing Events, IO Organization, Programmed Data Mode, Polling, Interrupt Mode, Issues in Handling Interrupts, DMA Mode of Data Transfer, A Few Additional Remarks, HW/SW Interface, Device Drivers, Handling Interrupt Using Device Drivers, Management of Buffers, Some Additional Points, Motivation For Disk Scheduling, Disk Scheduling Policies.

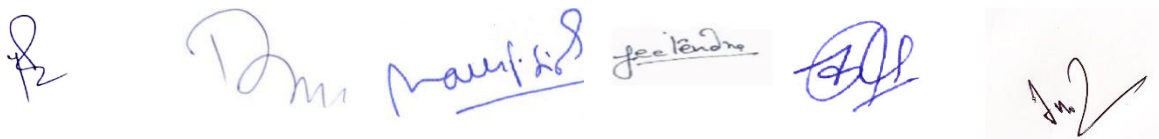
Unit VI

Introduction to Resource sharing and Management, Need for Scheduling, Mutual Exclusion Deadlocks, Deadlock Prevention Method, Deadlock Detection and Prevention Algorithms Mutual Exclusion Revisited: Critical Sections, Basic Properties of Semaphores, Usage of Semaphore, Some Additional Points.

Unit VII

Introduction to Inter-Process communication, Creating A New Process: The *fork()* System Call, Assigning Task to a Newly Spawned Process, Establishing Inter-process Communication Pipes as a Mechanism for Inter-process Communication, Shared Files, Shared Memory Communication, Message-Based IPC, Signals as IPC.

Unit VIII

The image shows several handwritten signatures and initials in blue ink. From left to right, there is a stylized 'R', a signature that appears to be 'Dm. Mansoor', a signature that appears to be 'Jeevendra', a signature that appears to be 'AJP', and a signature that appears to be 'Am2'.

Introduction to Real-time Operating Systems and Microkernels, Characteristics of real-time

systems, Classification of Real-time Systems, Microkernels and RTOS, OS for Hand-held Devices, Rate Monotonic Scheduling, Earliest Deadline First Policy, Earliest Least Laxity First Policy, Priority Inversion.

Block III

Unit IX

Introduction to OS and Security, Security Breaches, Examples of Security Breaches, Attack Prevention Methods, User Authentication, Security Policy and Access Control.

Unit X

Introduction to Unix Primer, Motivation, Unix Environment, Unix File System, Some Useful Unix Commands, Unix Portability. Search and Sort Tools, *grep*, *egrep* and *fgrep*, Using *find*, Sort Tool, AWK Tool in Unix The Data to Process, AWK Syntax, Programming Examples, Some One-liners, AWK Grammar, More Examples, More on AWK Grammar.

Unit XI

Shell Scripts in UNIX, Facilities Offered by Unix Shells, The Shell Families, Subshells, The Shell Programming Environment, Some Example Scripts, Example Shell Scripts, Unix Kernel Architecture, User Mode and Kernel Mode, System Calls, An Example of a System Call, Process States in Unix, Kernel Operations, The Scheduler, Linux Kernel
Linux Sources and URLs

Unit XII

Make Tool In UNIX, When to Use Make, How Make Works?, Macros, Abstractions, and Shortcuts, Inference Rules in Make, Some Additional Options, Mastermakefiles, Some Other Tools in UNIX, Tar and Other Utilities, Compression, Image File Formats for Internet

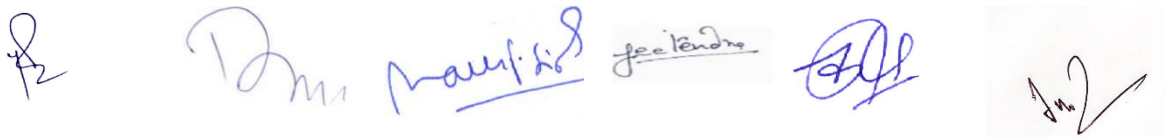
Applications, Performance Analysis and Profiling, Source Code Control System in UNIX, How Does Versioning Help, The SCCS, How This Is Achieved?, SCCS Command Structure, An Example Session, CVS : Concurrent Versioning System.

Unit XIII

X Windows in UNIX, Graphical User Interface (GUI), X-Window System, Some Standard X-clients, Hosts, Selecting a host for Display, X-Utilities, Startup, Motif and X. System Administration in UNIX, Unix Administration Tasks, Administration Tasks List Starting and Shutting Down, Managing User Accounts, The *.rc* Files, Sourcing Files Device Management and Services, The Terminal Settings, Printer Services, Disk space allocation and management.

Unit XIV

More on LINUX (Linux Kernel Architecture), Linux Kernel:Hardware, The Linux Kernel Purpose of the Kernel, TheLinux Kernel Structure Overview, Process Management Scheduler, The Memory Manager, The Virtual File System (VFS), The Network Interface, Inter Process Communication, System Calls, Systems Call Interface in Linux, The Memory Management Issues, Linux File Systems, *Device specific files*, The Virtual File system, The VFS Structure and file management in VFS, The Second Extended File System (EXT2FS), Advanced Ext2fs features, Physical Structure, The EXT3 file system, THE PROC FILE SYSTEM, DEVICE DRIVERS ON LINUX, Device classes, Block devices, Network devices, Major/minor numbers, Character Drivers, Important Data Structure, The file operations structure(fops):<linux/fs.h>, Advance Char Driver Operations, Blocking and non-blocking operations, Asynchronous Notification, Interrupt Handling in LINUX 2.4, Top Half And Bottom Half Processing, Linux Installation, The Installation, The Installation Program, Finishing the installation.

A row of handwritten signatures and initials in blue ink. From left to right: a stylized 'R' or 'B' with a subscript '2'; a signature that appears to be 'Dm. Manish'; a signature that appears to be 'Jeevan'; a signature that appears to be 'A. S.'; and a signature that appears to be 'Anu'.

Suggested Reading:

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley-Indian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Principles of Operating Systems by Naresh chauhan, Oxford Press (2014).
4. Operating Systems by D.M. Dhamdhare, Tata McGraw Hill 2nd edition.
5. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000.
6. UNIX Concepts and Applications(4th Edition)– by Sumitabha Das, Tata McGraw Hill.
7. Unix Shell Programming – by Yashwant Kanetkar, BPB publications.

MCS-505**DBMS****Block I****Unit-I**

Introduction to DBMS, Database system and application, Purpose of database system, Characteristics and Benefits of a Database, Components of DBMS, Merits and Demerits of DBMS, Database Architecture, Traditional file systems, View of data, Database language languages , Data Dictionary, Types of DBMS: Centralized DBMS, Parallel DBMS, Distributed DBMS, Client-Server DBMS; Relational databases, Database Design, Database Administrator.

Unit-II

Introduction to Data Model, What is Data Model, Need for Data Model, Types of Data Model ER Model

Unit-III

Introduction, What is Relational data model, Relation, Tuple, Attribute, Cardinality, Degree, Domain

Block II**Unit-IV**

Introduction to SQL, Characteristic of SQL ,Basic Structure of SQL Queries , Basic Data Types SQL Commands, Useful Relational Operator , Aggregate Functions, SUM function.

Unit-V

Introduction, Compound Conditions and Logical Operators, AND Operator, OR Operator Combining AND and OR Operators ,IN Operator, BETWEEN Operator, NOT Operator Order of Precedence for Logical Operators, LIKE Operator, Concatenation Operator, Alias Column Names, ORDER BY Clause, Handling NULL Values

Unit-VI

Introduction to Normalization, Normalization and Its Objectives, Normal Forms: First Normal Form (1NF),Second Normal Form (2NF),Third Normal Form (3NF), Boyce-Codd Normal Form (BCNF), Fourth Normal Form (4NF), Fifth Normal Form (5NF)

Block-III

Unit-VII

Introduction to keys, Keys, Types of Keys: Super Key, Candidate Key, Primary Key, Alternate Key, Composite Key, Foreign Key.

Unit-VIII

Introduction to database recovery and security, Back up of Database: SQL Server Backup – Scopes and Types, Backup Scopes, Backup Types, Back Up Tools, Types of Database Failure, Types of Database Recovery: Developing a Backup and Recovery Strategy, General Types of Recovery, Structure of Recovery, Recoverable Database Backup Operations, Automated Backup Operations; Database Security.

Unit-IX

Introduction, Model Concept: Basic Terminology, Relational Schema and Instances; Integrity Constraints: Entity Integrity Constraints, Referential Integrity Constraints; Domain Constraints, the CODD Commandments.

Suggested Reading:

1. An introduction to Database Systems, C J Date, Addison-Wesley.
2. Database System Concepts, Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw Hill.
3. Understanding SQL by Martin Gruber, BPB
4. SQL- PL/SQL by Ivan bayross
5. Oracle – The complete reference – TMH /oracle press

Introduction to Computer Network

MCS-506

Block 1

Unit I

Introduction to computer network, Historical background of computer network, network topologies, Classification Based on Transmission Technology, Broadcast Networks, Point to point networks, LAN, WAN, MAN, internet, application of internet.

Unit II

Introduction to transmission media, guided transmission, unguided transmission, Introduction to Transmission Impairments and Channel Capacity, attenuation, Delay distortion, Noise, Bandwidth and Channel Capacity.

Unit III

Introduction to Network Topology, Mesh Topology, Bus Topology, STAR Topology, Ring topology, Tree Topology, Unconstrained Topology, Combination of topology and transmission media. Introduction to Medium Access Control (MAC), Goals of MACs, Round Robin Techniques Polling, Token Passing, Contention-based Approaches, ALOHA, CSMA, CSMA/CD. Introduction to IEEE CSMA/CD based LANs, IEEE 802.3 and Ethernet, Ethernet - A Brief History, 5.3.2.2 Ethernet Architecture, Encoding for Signal Transmission, The Ethernet MAC Sublayer, The Basic Ethernet Frame Format ,Other important issues.

Unit IV

Introduction to IEEE Ring LANs and High Speed LANs –Token Ring Based, Token Ring (IEEE 802.5), Token Ring Operation, Priority System, Ring Maintenance, Physical Layer Frame

Format, Token Bus (IEEE 802.4), Functions of a Token Bus, Frame Form, Logical ring maintenance, Relative comparison of the three standards.

Unit V

Introduction to High Speed LANs – Token Ring Based, FDDI, Medium, Topology, Fault Tolerance, Frame Format Media Access Control, FDDI and the OSI model, Comparison, Introduction to High Speed LANs – CSMA/CD, Successors of Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet and Brief History and the IEEE 802.3z Task Force, Similarities and advances over Ethernet (IEEE 802.3), Gigabit Ethernet Protocol Architecture GMII (Gigabit Media Independent Interface), Media Access Control Layer.

Block II

Unit VI

Introduction to Wireless LANs, Transmission Media, Infrared, Microwave, Radio, Topology Medium Access Control, Carrier Sense Multiple Access with Collision Avoidance (CSMA-CA), Framing, Security, IEEE 802.11 extensions.

Unit VII

Introduction to Bluetooth, Topology, Bluetooth Architecture, Bluetooth Layers ,Layer 1: Radio Layer, Layer 2: Baseband Layer, Layer 3: Link Manager Protocol, Layer 4: Host Controller Interface, Logical Link Control and Adaptation Protocol, Layer 6: Radio Frequency Communication (RFCOMM), Layer 7: Service Discovery Protocol, Telephony Control Protocol Spec (TCS), Application Program Interface (API) libraries

Unit VIII

Introduction Cellular Telephone Networks, Cellular Telephone System, Frequency Reuse Principle, Transmitting and Receiving, Mobility Management, Medium Access Control Techniques, First Generation Second Generation System, Second Generation , Third Generation.

Unit- IX

Introduction to Internetworking Devices, Repeaters, Hubs, Bridges, Transparent Bridges, Bridge Forwarding, Bridge Learning , Source Routing Bridges, Switches, Routers, Gateways A Simple Internet.

Unit X

Introduction to Internet Protocol (IP), Addressing, IP Addressing, Subnetting, Network Address Translation (NAT), Address Resolution Protocol (ARP), IP Datagram, Multiplexing and Demultiplexing, Fragmentation and Reassembly, ICMP, IPV6

Unit XI

Introduction to Transport and Application Layer Protocols, User Datagram protocol (UDP) Transmission Control Protocol (TCP), Client-Server Paradigm and its Applications.

Unit XII

Introduction to Routing and Congestion Control, Classification of Routers, Routing Algorithm Metrics, Fixed or Static Routing, Flooding, Intradomain versus Interdomain

Block III

Unit XIII

Introduction to RIP – Routing Information Protocol, Routing Table Format, RIP Timers, Hop-Count Limit, Solution To Slow Convergence Problem., RIP Message Format, RIP version 2.\

Unit XIV

Introduction to Open Shortest Path First (OSPF) and Border Gateway Protocol (BGP)

Link-State Algorithm, Routing Hierarchy in OSPF, OSPF Message Format, Additional OSPF Features, Introduction to Border Gateway Protocol, BGP Characteristics, BGP Functionality and Route Information Management, BGP Attributes, BGP Path Selection, BGP Message type, BGP Fixed Header Format, BGP OPEN Message, BGP UPDATE Message, BGP NOTIFICATION Message, BGP KEEPALIVE Message

Unit XV

Introduction to Congestion Control, Causes Of Congestion, Effects of Congestion, Congestion Control Techniques, Leaky Bucket Algorithm, Token Bucket Algorithm, Congestion control in virtual Circuit, Choke Packet Technique, Hop-by Hop Choke Packets Load Shedding, Slow Start - a Pro-active technique, Flow Control Versus Congestion control.

Unit XVI

Introduction to Cryptography and Secured Communication, Symmetric Key Cryptography Monoalphabetic Substitution, Polyalphabetic Substitution, Transpositional CipherBlock Ciphers, Data Encryption Standard(DES), Encrypting a Large Message, Triple DES, Public key Cryptography, RSA, Introduction to Secured Communication, Security Services, Privacy, Authentication, Integrity and Nonrepudiation using Digital Signature, User Authentication using symmetric key cryptography, User Authentication using Public Key Cryptography, Key Management, Application Layer Security, Virtual Private Network (VPN)

Unit XVII

Introduction to Firewalls, Why a Firewall is needed?, Access Control Policies, Firewall Capabilities, Limitations of a Firewall, Types of Firewalls, Bastion Host, Network Address Translation, Firewall Configurations, Active Firewall Elements.

Suggested Reading:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
3. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.
5. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill, 2011.

Design and Analysis of Algorithm

MCS -507

Syllabus and course contents are adopted from the course contents available at ePGPathshala

<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=7>

Programming in JAVA

MCS-508

Block 1: Object Oriented Methodology and Java

Unit 1: Object Oriented Programming

Paradigms of Programming languages, Evolution of Object Oriented Methodology, Basic Concepts of OOAApproach, Comparison of object oriented and procedure - oriented Approaches, Benefits of OOPS,Applications of OOPS. Classes and objects, Abstraction and Encapsulation, Inheritance, Method overriding and Polymorphism.

Unit 2: Java Language Basics

Introduction to Java, Primitive Data Type and Variables, Java Operators.

Unit 3: Expressions Statements and Arrays

Expressions, Statements, Control Statements, Selection Statements, Iterative Statements, Jump statements, Arrays.

Block 2: Object oriented concepts and Exceptions Handling

Unit 4: Class and objects

Class Fundamentals, Introducing Methods, this Keyword, Using objects as Parameters, Method overloading, Garbage collection, the finalize () Method.

Unit 5: Inheritance and Polymorphism

Inheritance Basics, Access, Multilevel, inheritance, Method overriding Abstract classes, Polymorphism, Final Keyword.

Unit 6: Packages and interfaces

Package, Accessibility of Packages, using Package members, Interfaces, Implementing interfaces, interface and Abstract classes, Extends and Implements together.

Unit 7: Exceptions Handling

Exception, Handling of Exception, Types of Exceptions, Throwing, Exceptions, writing Exception subclasses.

Block 3: Multithreading, I/O, and Strings Handling

Unit 8: Multithreaded Programming

Multithreading, The Main thread, JAVA Thread Model, Thread Priorities, Synchronization in JAVA, Inter thread Communication.

Unit : I/O In Java

I/O Basics, Streams and stream, Classes, the predefined streams, Reading from and writing to console, reading and writing files, the transient and volatile Modifiers, using instance of Native Methods.

Unit 10: Strings and Characters

Fundamental of Characters and Strings, the String class, String operations, Data Conversion using value of () Methods, Strings Buffer and Methods.

Unit 11: Exploring Java I/O

Java I/O classes and interfaces, Stream classes, Text streams, Stream Tokenizer, Serialization,Buffered stream, print stream, Random Access file.

Block 4: Graphics and user interfaces

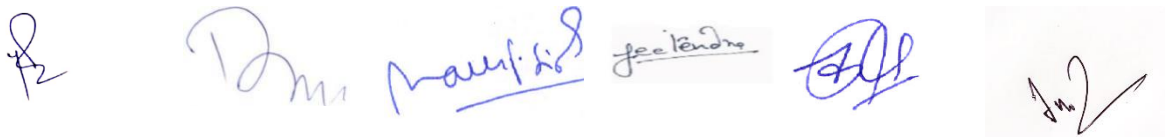
Unit 12: Applets

The applet class, Applet architecture, An applet Skeleton: Initialization and Termination, Handling events, HTML Applet TAG.

Unit 13: Graphics and user interfaces

Graphics contests and Graphics objects, user interface components, Building user interface withAWT, Swing - Based GUI, Layouts and layouts and layout Manager, Container.

Unit 4: Networking Features

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Socket overview, reserved parts and proxy servers, Internet Addressing: Domain Naming Services (DNS),
Java and The Net: URL, TCP/IP Sockets, Datagrams.

INFORMATION SECURITY ASSURANCE: FRAMEWORK, STANDARDS & INDUSTRY BEST PRACTICES

MCS-601

BLOCK I

Unit 1: Interrelationship between Regulation, policies, standard procedures and guidelines, Standards for Information Security: ISO standards- ISO/IEC 27002:2005 (Code of Practice for Information Security Management), ISO/IEC 27001:2005 (Information Security Management System - Requirements),

Unit II: Regulations related to Information Security- SOX, GLBA, COSO, HIPPA, FISMA, FIPS, FFIEC, common elements of compliance, Security controls, common pitfalls of a effective Information Security program.

Unit III: ISO/IEC 15408 (Evaluation Criteria for IT Security), ISO/IEC 13335 (IT Security Management); Payment Card Industry data security standards, COBIT, ITIL (OR ISO/IEC 20000 SERIES)

Unit IV: Introduction to industry best practices including NIST, SANS ,OWASP

BLOCK II

Unit I: Overviews of ISO-27K.

Unit II: ISO 27001

Unit III: ISO-27002

Unit IV: Other standards, guidelines, ISO- 27005

BLOCK III

Unit I: Security auditing

Unit II: Information security

Unit III: Disaster recovery

Unit IV: Business continuity planning and management

Computer System Architecture (CSA)

MCS-602

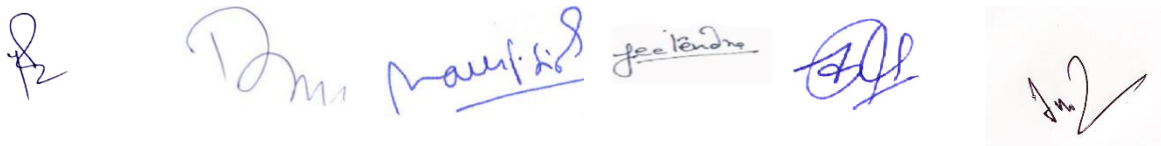
Block I

Unit I: Introduction to computer system and its submodules, Number System and Representation of information

Unit II: Arithmetic and Logical operation and hardware implementation, Software implementation of some complex operation, Arithmetic and Logic Unit, Introduction to memory Unit, control unit and Instruction Set

Unit III: Working with an ALU, Concepts of Machine level programming, Assembly level programming and High level programming.

Unit IV: Various addressing modes and designing of an Instruction set, Concepts of subroutine and subroutine call, Use of stack for handling subroutine call and return.

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Block II

Unit V: Introduction to CPU design, Instruction interpretation and execution, Micro-operation and their RTL specification

Unit VI : Hardwired control CPU design

Unit VII : Microprogrammed control CPU design

Unit VIII: Concepts of semiconductor memory, CPU- memory interaction, organization of memory modules, Cache memory and related mapping and replacement policies, Virtual memory.

Block III

Unit IX : Introduction to input/output processing, working with video display unit and keyboard and routine to control them

Unit X: Programmed controlled I/O transfer, Interrupt controlled I/O transfer, DMA controller.

Unit XI : Secondary storage and type of storage devices, Introduction to buses and connecting I/O devices to CPU and memory.

Unit XII : Introduction to RISC and CISC paradigm, Design issues of a RISC processor and example of an existing RISC processor.

Block IV

Unit XIII: Introduction to pipelining and pipeline hazards, design issues of pipeline architecture, Instruction level parallelism and advanced issues, Introduction to interconnection network and practical issues, Examples of interconnection networks.

Unit XIV: Multiprocessors and its characteristics, Memory organization for multiprocessors systems.

Unit XV: synchronization and models of memory consistency, Issues of deadlock and scheduling in multiprocessor systems, Cache in multiprocessor systems and related problems, Cache coherence protocols

Unit XVI: Parallel processing concepts, Parallelism algorithm for multiprocessor systems.

Web Technology

(MCS-E1)

Adopted from ePGPathshala

<https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=7>

Basics of Remote Sensing and GIS(MCS-E4)

The contents of the syllabus available at

<https://uou.ac.in/sites/default/files/syllabus/GIS-505.pdf>

Fundamental of Information security (MIT(CS)-101

The contents of the syllabus available at

[https://uou.ac.in/sites/default/files/slm/MIT\(CS\)-101.pdf](https://uou.ac.in/sites/default/files/slm/MIT(CS)-101.pdf)

Cyber Security Technique(MIT(CS)-102

The contents of the syllabus available at

[https://uou.ac.in/sites/default/files/slm/MIT\(CS\)-102.pdf](https://uou.ac.in/sites/default/files/slm/MIT(CS)-102.pdf)

Information System

MIT(CS)-104

The contents of the syllabus available at

[https://uou.ac.in/sites/default/files/slm/MIT\(CS\)-104.pdf](https://uou.ac.in/sites/default/files/slm/MIT(CS)-104.pdf)

Digital Forensics

MIT(CS)-202

The contents of the syllabus available at

[https://uou.ac.in/sites/default/files/slm/MIT\(CS\)-202.pdf](https://uou.ac.in/sites/default/files/slm/MIT(CS)-202.pdf)

Formal Language and Automata (MCS-E5)

The contents of the syllabus available at

<https://docs.google.com/document/d/1n2Zqt9QAuI1WAr--AT8Gc0TfNWdWP4qW/edit?rtfpoof=true&sd=true>

Information system for Business (MCA-E8)

The contents of the syllabus available at

<https://uou.ac.in/sites/default/files/slm/MCS-406.pdf>

Project Management

The contents of the syllabus available at

<https://drive.google.com/file/d/1Ri-9WGrFR6RSyYAqpbDPYE13oVaV1wko/view?usp=sharing>

Wireless Network

MCA(E-10)

The contents of the syllabus available at

<https://docs.google.com/document/d/1WG-PGvCDGVtVuCDFpP7oVwniQQVO-WFR/edit?usp=sharing&oid=114813638161261814166&rtpof=true&sd=true>

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