Format-3

IIMTUNIVERSITY
Year – I /Semester – I

Programme:Degree **Class:MCA**	**Year: I** **Semester: I**
Credits **Theory**:4Cr	**Subject:** Fundamental of Computers & Emerging Technologies
Course Code: **MCA - 111**	**Title :** Fundamental of Computers & Emerging Technologies

Course Objectives:

CO1 Demonstrate the knowledge of the basic structure, components, features and generations of computers.

CO2: Describe the concept of computer languages, language translators and construct algorithms to solve problems using programming concepts.

CO3: Compareandcontrastfeatures,functioning&typesofoperatingsystemandcomputernetworks

CO4: Demonstratearchitecture,functioning&servicesoftheInternetandbasicsofmultimedia.

CO5: IllustratetheemergingtrendsandtechnologiesinthefieldofInformationTechnology.

Nature of Paper: CORE COURSE

Minimum Passing Marks/Credits:40% Marks

L:3
T:1
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Computer:** Definition, Computer Hardware & Computer Software **Components:** Hardware–Introduction, Input devices, Output devices, Central Processing Unit, Memory-Primary and Secondary. Software-Introduction, Types–System and Application. **Computer Languages:** Introduction, Concept of Compiler, Interpreter & Assembler. **Problem solving concept:** Algorithms–Introduction, Definition, Characteristics,Limitations, Conditions in pseudo-code, Loops in pseudo code.	8
II	**Operating system:** Definition, Functions, Types, Classification, Elements of command based and GUI based operating system. **Computer Network:** Overview, Types (LAN, WAN and MAN), Data communication, topologies.	8
III	**Internet:** Overview, Architecture, Functioning, Basic services like WWW, FTP, Telnet, Gopher etc., Search engines,E-mail,WebBrowsers. **Internet of Things (IoT):** Definition, Sensors, their types and features, Smart Cities, Industrial Internet of Things.	8
IV	**Blockchain:** Introduction, overview, features, limitations and application areas	8

	fundamentals of Block Chain. **Crypto currencies:** Introduction, Applications and use cases. **Cloud Computing:** It nature and benefits, AWS, Google, Microsoft & IBM Services	
V	**Emerging Technologies:** Introduction, over view, features, limitations and application areas of Augmented Reality, Virtual Reality, Grid computing, Greencomputing, Big data analytics, Quantum Computing and Brain Computer Interface.	8

Text Books:

1. RajaramanV.,"FundamentalsofComputers",Prentice-HallofIndia.
2. NortonP.,"IntroductiontoComputers",McGrawHillEducation.
3. GoelA.,"ComputerFundamentals",Pearson.

Reference

1. Balagurusamy E., "Fundamentals of Computers", McGraw Hill.
2. Thareja R., "Fundamentals of Computers", Oxford University Press.

Evaluation/Assessment Methodology

	Max. Marks100
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments	20
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Demonstrate the use of mathematical software and solve simple mathematical problems.
CO2: Explain the needs of hardware and software required for a computation task.
CO3: State typical provisions of cyber law that govern the proper usage of Internet and computing resources.
CO4: Explain the working of important application software and their use to perform any engineering activity.
CO5: Demonstrate the use of Operating system commands and shell script.

Format-3

IIMT UNIVERSITY
Year – I /Semester – I

Programme: Degree **Class: MCA**	**Year: I** **Semester: I**
Credits Theory:4Cr	**Subject: PROBLEM SOLVING USING C**
Course Code: **MCA - 112**	**Title: PROBLEM SOLVING USING C**

Course Objectives:

CO1: Describe the functional components and fundamental concepts of a digital computer system including number systems.
CO2: Construct flow chart and write algorithms for solving basic problems.
CO3: Write simple programs using the basic elements like control statements, functions, arrays and strings.
CO4: Write advanced programs using the concepts of pointers, structures, unions and enumerated data types.
CO5: Apply pre-processor directives and basic file handling and graphics operations in advanced programming.

Nature of Paper: CORE COURSE

Minimum Passing Marks/Credits:40% Marks

L:3
T:1
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Basics of programming:** Approaches to problem solving, Use of high-level programming language for systematic development of programs, Concept of algorithm and flow chart, Concept and role of structured programming. **Basics of C**: History of C, Salient features of C, Structure of C Program, Compiling C Program, Link and Run C Program, Character set, Tokens, Keywords, Identifiers, Constants, Variables, Instructions, Data types, Standard Input / Output, Operators and expressions.	8
II	**Conditional Program Execution:** if, if-else, and nestedif-else statements, Switch statements, Restrictions on switch values, Use of break and default withs witch, Comparison of switch and if-else. **Loops and Iteration:** for, while and do-while loops, Multi ple loop variables, Nested loops, Assignment operators, break and continue statement. **Functions:** Introduction, Types, Declaration of a Function, Function calls, defining functions, Function Proto types, Passing arguments to a Function Return values and their types, writing multi-function program, Calling function by value, Recursive functions.	8
III	**Arrays:** Array notation and representation, Declaring one-dimensionalarray, Initializing arrays, Accessing array elements, Manipulating arrayelements, Arrays of unknown or varying size, Two-dimensional arrays, Multi	8

	dimensional arrays. **Pointers:** Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, array of pointers, Pointers to functions, Pointer to pointer, Array of pointers. **Strings:** Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.	
IV	**Structure:** Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. **Union:** Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types **Storage classes**: Introduction, Types- automatic, register, static and external.	8
V	**Dynamic Memory Allocation**: Introduction, Library functions–malloc, calloc, realloc and free. **File Handling:** Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files. **Graphics:** Introduction, Constant, Data types and global variables used in graphics, Library functions used in drawing, Drawing and filling images, GUI interaction within the program.	8

Text Books:

1. Kanetkar Y., "Let UsC", BPB Publications.
2. Hanly J. R. and Koffman E. B., "Problem Solving and Program Design in C", Pearson Education.
3. Schildt H., "C- The Complete Reference", Mc Graw-Hill.

Reference

1. Goyal K.K. and Pandey H.M., Trouble FreeC", University Science Press.
2. Gottfried B.,"Schaum's Outlines-Programmingin C", McGraw-Hill Publications.

Evaluation/Assessment Methodology

Max. Marks100

1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Students will be able to develop programs based on fundamental concepts of programming in C.
CO2: Students will be able to solve problems based on Conditional and Iterative Control Statements.
CO3: Students will be able to learn Complete Programming Concepts of Arrays, Pointers and get familiar with modular programming Concepts of C using Functions.
CO4: Students will be able to learn conceptual programming with String, Structure and its differentiation with Union.
CO5: Students will be able to perform File handling programs with read and write concepts.

Format-3

IIMT UNIVERSITY
Year – I /Semester – I

Programme: Degree **Class: MCA**	**Year: I** **Semester: I**
Credits Theory:4Cr	**Subject:** Principles of Management & Communication
Course Code: **MCA - 113**	**Title:** Principles of Management & Communication

Course Objectives:

CO1: Describe primary features, processes and principles of management.
CO2: Explain functions of management in terms of planning, decision making and organizing.
CO3: Illustrate key factors of leadership skill in directing and controlling business resources and processes.
CO4: Exhibited quat ever bal and non-verbal communication skills.
CO5: Demonstrate effective discussion, presentation and writing skills.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks

L:4
T:0
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Management**: Need, Scope, Meaning and Definition. The process of Management, Development of Management thought F.W. Taylor and Henry Fayol, Horothorne Studies, Qualities of an Efficient Management.	8
II	**Planning &Organising:** Need, Scope and Importance of Planning, Steps in planning, Decision making model. Organising need and Importance, Organisational Design, Organisational structure, centralization and Decentralisation, Deligation.	8
III	**Directing & Controlling:** Motivation—Meaning, Importance, need. Theories of Motivation, Leadership—meaning, need and importance, leadership style, Qualities of effective leader, principles of directing, Basic control process, Different control Techniques.	8
IV	**Introduction to Communication:** What is Communication, Levels of communication, Barriers to communication, Process of Communication, Non-verbal Communication, The flow of Communication: Downward, Upward, Lateralor Horizontal (Peer group) Communication, Technology Enabled communication, Impact of Technology, Selection of appropriate communication Technology, Importance of Technical communication.	8
V	**Business letters:** Sales & Credit letters; Claim and Adjustment Letters; Job application and Resumes. **Reports:** Types; Structure, Style & Writing of Reports. **Technical Proposal:** Parts; Types; Writing of Proposal; Significance. Nuances of Delivery; Body Language; Dimensions of Speech: Syllable;	8

	Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Communication skills, Presentation strategies, Group Discussion; Interview skills; Workshop; Conference; Seminars.	

Text Books:

1. P.C. Tripathi, P.N. Reddy, "Principles of Management", Mc Graw Hill Education 6th Edition.
2. C.B. Gupta, "Management Principles and Practice", Sultan Chand & Sons 3rd edition.
3. T.N. Chhabra, "Business Communication", Sun India Publication.

Reference

1. V.N. Aroraand Laxmi Chandra, "Improve Your Writing", Oxford Univ. Press, 2001, New Delhi.
2. Madhu Rani and Seema Verma, "Technical Communication: A Practical Approach", Acme Learning, New Delhi-2011.

Evaluation/Assessment Methodology

Max. Marks :100

1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Identify different concept of management.
CO2: Able to understand the importance of planning and orgaising.
CO3: Able to explore communication beyond language.
CO4: Able to manage oneself while communicating.
CO5: Able to acquire good communication skills and develop confidence.

Format-3

IIMT UNIVERSITY
Year – I /Semester – I

Programme: Degree **Class: MCA**	**Year: I** **Semester: I**
Credits Theory:4Cr	**Subject:** Discrete Mathematics
Course Code: **MCA - 114**	**Title:** Discrete Mathematics

Course Objectives:

CO1: Use mathematical and logical notation to define and formally reason about basic discrete structures such as Sets, Relations and Functions.
CO2: Apply mathematical arguments using logical connectives and quantifiers to check the validity of an argument through truth tables and pro positional and predicate logic.
CO3: Identify and prove properties of Algebraic Structures like Groups, Rings and Fields.
CO4: Formulate and solve recurrences and recursive functions.
CO5: Demonstrate effective discussion, presentation and writing skills.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks

L:4
T:0
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Set Theory:** Introduction, Size of sets and Cardinals, Venn diagrams, Combination of sets, Multi sets, ordered pairs and Set Identities. **Relation:** Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. **Functions:** Definition, Classification of functions, Operation son functions, recursively defined functions.	8
II	**Posets, Hasse Diagram and Lattices:** Introduction, Partial ordered sets, Combination of Partial ordered sets, Hasse diagram, Introduction of lattices, Properties of lattices–Bounded, Complemented, Modular and Complete lattice. **Boolean Algebra:** Introduction, Axioms and Theorems of Booleanalgebra, Boolean functions. Simplification of Boolean functions, Karnaughmaps, Logic gates.	8
III	**Propositional:** Propositions, Truth tables, Tautology, Contradiction, Algebra of Propositions, Theory of Inference and Natural Detection. **Predicate Logic:** Theory of Predicates, First order predicate, Predicate formulas, Quantifiers, Inference theory of predicate logic.	8
IV	**Algebraic Structures:** Introduction to algebraic Structures and properties. Types of algebraic structures: Semi group, Monoid, Group, Abelian group and Properties of group. Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism and Isomorphism of groups.	8

	Rings and Fields: Definition and elementary properties of Rings and Fields.	
V	**Natural Numbers:** Introduction, Piano's axioms, Mathematical Induction, Strong Induction and Induction with Non zero Base cases. **Recurrence Relation & Generating functions:** Introduction and properties of Generating Functions. Simple Recurrence relation with constant coefficients and Line arrecurrencerelation without constant coefficients. Methods of solving recurrences. **Combinatorics:** Introduction, Counting techniques and Pigeon hole principle, Polya's Counting the orem.	8

Text Books:

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill, 2006.
2. B. Kolman, R.C Bus by and S.C Ross,"Discrete Mathematics Structures", Prentice Hall, 2004.

Reference

1. Krishnamurthy, "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.
2. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill Approach", Acme Learning, New Delhi-2011

Evaluation/Assessment Methodology

	Max. Marks :100
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Able to identify the properties of functions and relations.
CO1: Able to understand the concepts of sets and perform operations.
CO3: Able to verify the correctness of an argument using truth tables.
CO4: Able to solve problem using counting techniques and combinatorics.
CO5: Able to analyze preposition and predicate logics.

Format-3

IIMT UNIVERSITY
Year – I /Semester – I

Programme: Degree **Class:MCA**		**Year: I** **Semester: I**
Credits Theory:4Cr	**Subject:** Computer Organization & Architecture	
Course Code: **MCA - 115**	**Title:** Computer Organization & Architecture	

Course Objectives:

CO1: Describe functional units of digital system and explain how arithmetic and logical operations a reaper formed by computers.
CO2: Describe the operations of control unit and write sequence of instructions for carrying out simple operation u sing various addressing modes.
CO3: Design various types of memory and its organization.
CO4: Describe the various modes in which IO devices communicate with CPU and memory.
CO5: List the criteria for classification of parallel computer and describe various architectural schemes.

Nature of Paper: CORE COURSE

Minimum Passing Marks/Credits:40% Marks

L:3
T:1
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Functional units of digital system and their inter connections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Process or organization:** general registers organization, stack organization and addressing modes.	8
II	**Arithmetic and logic unit:** Looka head carries adders. Multiplication: Signed oper and multiplication, Booth's algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers.	8
III	**Control Unit:** Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro-operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hard wire and micro programmed control: micro-program sequencing, concept of horizontal and vertical micro programming.	8
IV	**Memory:** Basic concept and hierarchy, semi conductor RAM memories, 2D & 21/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	8

V	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access, I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	8

Text Books:

1. John P.Hayes ,"Computer Architecture and Organization", McGraw Hill.
2. William Stallings, "Computer Organization and Architecture-Designing for Performance", Pearson Education.
3. M. Morris Mano, "Computer System Architecture", PHI.

Reference

1. David A. Patterson and John L. Hennessy, Computer Architecture- A Quantitative Approach", Elsevier Pub.
2. Tannen baum, "Structured Computer Organization", PHI.

Evaluation/Assessment Methodology

Max. Marks100

1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: For a microprocessor system, student should be able to deal with the internal architecture of 8 bits and 16-bit microprocessor to analyze the working operation and to know the pin configuration for the respective microprocessor. A student should be good enough to deal with interrupts internally or externally.

CO2: He/she should be able to understand the basic concepts of Assembly language programming. For a particular data instruction set, student should be having a clear idea of solving machine language programs using kit. He/she shall be having an idea to tackle with counter delays and subroutines.

CO3: He/she should be able to know the concept of pipelining and parallelism in uniprocessor system for hazard detection. Understand the basic concept of Parallel computing.

CO4: A student should have a basic idea of job levels that are governed by an organization on priority basis. He/she should know the Pipeline scheduling theory.

CO5: For good networking, a student should be able to draw SIMD interconnections and FFT or a butterfly method system for collision prevention and vector dispatching. He/she should be able to make Cube Interconnection Network, Shuffle-Exchange and Omega Network

Format-3

IIMT UNIVERSITY
Year- I / Semester –I

Program: Degree **Class: MCA**		Year: I Semester: I
Credits Theory: 0 Practical: 2	**Subject:** Computer Organization & Architecture Lab	
Course Code: **MCA -117P**	**Title:** Computer Organization & Architecture Lab	

Course Objectives:

CO1: Design and verify combinational circuits (adder, code converter, decoder, multiplexer) using basic gates.
CO2: Design and verify various flip-flops.
CO3: Design I/O system and ALU.
CO4: Demonstrate combinational circuit using simulator.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks

L:0
T:0
P:4(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Implementing HALF ADDER, FULL ADDER using basic logic gates	02
II	Implementing Binary -to -Gray, Gray -to -Binary code conversions.	02
III	Implementing 3–8-line DECODER. Implementing 4x1 and 8x1 MULTI PLEXERS.	02
IV	Verify the excitation tables of various FLIP-FLOPS	02
V	Design of an 8-bit Input / Output system with four 8-bit Internal Registers.	02
VI	Design of an 8-bit ARITHMETIC LOGIC UNIT.	02
VII	Design the data path of a computer from its register transfer language description.	02
VIII	Design the control unit of a computer using either hardwiring or micro programming based on its register transfer language description.	02

Reference / Text Books:

- John P. Hayes, "Computer Architecture and Organization", McGraw Hill.
- William Stallings, "Computer Organization and Architecture-Designing for Performance", Pearson Education.

Evaluation/Assessment Methodology	
	Max. Marks:50
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3) Assignments 4) Research Project Report Seminar On Research Project Report 5) ESE	10 10 30
Total:	50

Program Learning Outcomes:

CO1: Students will be able to develop flip-flops.
CO2: Students will be able to solve problems based on circuit design.
CO3: Students will be able to learn working of ALU.
CO4: Students will be able to Implement Binary-to -Gray, Gray -to -Binary code conversions
CO5: Students will be able to work with logic gates.

Format-3

IIMT UNIVERSITY
Year- I / Semester –I

Program: Degree **Class: MCA**	Year: I Semester: I
Credits Theory: 0 Practical: 2	**Subject: Problem-Solving using C Lab**
Course Code: **MCA -116P**	**Title: Problem-Solving using C Lab**

Course Objectives:

CO1: Students will be able to learn the basics of programming language and Fundamental concepts of C Language.

CO2: Students will be able to learn and understand Concepts of basic programming with Conditional and Iterative Control statements.

CO3: Students will be familiar with the concept of Arrays, Pointers, Functions, categories of function, and recursion.

CO4: Students will be able to develop a Program with Structure; learn Union and Complete String Operations.

CO5: Students will be familiar with File handling programs to perform read-write operations.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks

L:0
T:0
P:4(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Write a program to display “hello world” in C.	02
II	Write a program to find the largest and smallest among three entered numbers and also display whether the identified largest/smallest number is even or odd.	02
III	Write a program to check whether the entered year is a leap year or not (a year is a leap if it is divisible by 4 and divisible by 100 or 400.)	02
IV	Write a program to read a string and check for palindrome without using string-related functions (a string is a palindrome if its half is mirror by itself.	02
V	Write a program to find the biggest among three numbers using a pointer.	02
VI	Create a structure named company which has a name, address, phone, and as member variables. Read the name of the company, its address, phone, and no Of Employee. Finally display these members’ values.	02
VII	The BCT class and display the details from the function.	02
VIII	Write a program to show programming examples with unions and structures.	02

Reference / Text Books:

- The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie.
- C Programming: A Modern Approach" by K. N. King.

Evaluation/Assessment Methodology

Max. Marks:50

1) Class tasks/ Sessional Examination	10
2) Presentations /Seminar	10
3) Assignments	
4) Research Project Report Seminar On Research Project Report	
5) ESE	30
Total:	50

Program Learning Outcomes:

CO1: Students will be able to develop programs based on fundamental concepts of programming in C.

CO2: Students will be able to solve problems based on Conditional and Iterative Control Statements.

CO3: Students will be able to learn Complete Programming Concepts of Arrays, Pointers and get familiar with modular programming Concepts of C using Functions.

CO4: Students will be able to learn conceptual programming with String, Structure, and its differentiation with Union.

CO5: Students will be able to perform File handling programs with read and write concepts

Format-3

IIMT UNIVERSITY
Year – I /Semester – II

Programme: Degree **Class: MCA**		**Year: I** **Semester: II**
Credits Theory:4Cr	**Subject:** Theory of automata and formal languages	
Course Code: **MCA - 121**	**Title:** Theory of automata and formal languages	

Course Objectives:

CO1: Define various types of automata for different classes off or mallanguages and explain their working.
CO2: State and provekey properties of formal languages and automata.
CO3: Construct appropriate formal notations (such as grammars, acceptors, transducers and regular expressions) for given formal languages.
CO4: Convert among equivalent notations for formal languages.
CO5: Explain the significance of the Universal Turing machine, Church-Turingthesis and concept of Undesirability.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks

L:4
T:0
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Basic Concepts and Automata Theory:** Introduction to Theory of Computation-Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)-Definition ,Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output-Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA.	8
II	**Regular Expressions and Languages:** Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression-Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages-Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability-Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.	8
III	**Regular and Non-Regular Grammars**: Context Free Grammar (CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into	8

	CFG and Regular grammar into FA, Simplification of CFG, Normal Forms-Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	
IV	**Push Down Automata and Properties of Context Free Languages**: Nondeterministic Push down Automata (NPDA)-Definition, Moves, A Language Accepted by NPDA, Deterministic Push down Automata (DPDA) and Deterministic Context free Languages (DCFL), Push down Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	8
V	**Turing Machines and Recursive Function Theory**: Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post Correspondence Problem, Introduction to Recursive Function Theory.	8

Text Books:

1. J.E. Hopcraft, R. Motwani, and Ullman, "Introduction to Automata theory, Languages and Computation", Pearson Education Asia, 2nd Edition.
2. J. Martin, "Introduction to languages and the theory of computation", McGraw Hill,3rdEdition

Reference

1. K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science Automata Languages and Computation", PHI.
2. Y.N. Singh, "Mathematical Foundation of Computer Science", New Age International.

Evaluation/Assessment Methodology

	Max. Marks100
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Understand various types of automata and their working.
CO2: Understand key properties of formal languages and automata.
CO3: Able to construct automata for given formal languages..
CO4: Able to Convert among equivalent annotations for formal languages.
CO5: Understand the concept of Universal Turing machine, Church-Turing thesis and concept of Undesirability.

Format-3

IIMT UNIVERSITY
Year – I /Semester – II

Programme: Degree **Class: MCA**	**Year: I** **Semester: II**
Credits Theory:4Cr	**Subject:** Object oriented programming
Course Code: **MCA - 122**	**Title:** Object oriented programming

Course Objectives:

CO1: Definition of Object-Oriented Programming techniques.
CO2: Apply Object Oriented Programming techniques using Java.
CO3: Solve the real-world problems using of Packages, Interfaces, and apply Exceptions handling and Threading concepts in Java.
CO4: Develop I/O and GUI applications in java.
CO5: Design Database applications and swing programming in Java.

Nature of Paper: CORE

Minimum Passing Marks/Credits:40% Marks

L:3
T:1
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Object Oriented Programming: objects, classes, Abstraction, Encapsulation, Inheritance, Polymorphism, OOP in Java, Characteristics of Java, The Java Environment, Java Source File Structure, and Compilation. Fundamental Programming Structures in Java: Defining classes in Java, constructors, methods, access specifies, tatic members, Comments, Data Types, Variables, Operators, Control Flow, Arrays.	8
II	**Inheritance, Interfaces, and Packages:** Inheritance: Super classes, sub classes, Protected members, constructors in sub classes, Object class, abstract classes and methods. Interfaces: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces, Object cloning, inner classes. Packages: Defining Package, CLASS PATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention For Packages, Networking java. net package.	8
III	**Exception Handling, I/O**: Exceptions: exception hierarchy, throwing and catching exceptions, built-in exceptions, creating own exceptions, Stack Trace Elements. Input /Output Basics: Byte streams and Character streams, Reading and Writing, Console Reading and Writing Files.	8
IV	**Multithreading and Generic Programming:** Differences between multi-threading and multi tasking, thread lifecycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming: Generic classes, generic methods, Bounded Types: Restrictions and Limitations.	8

V	**Event Driven Programming:** Graphics programming: Frame, Components, working with 2D shapes, Using colors, fonts, and images. Basics of event handling: even thandlers, adapter classes, actions, mouse events, AWT event hierarchy. Introduction to Swing: layout management, Swing Components: Text Fields, Text Areas, Buttons, Check Boxes, Radio Buttons, Lists, choices, Scrollbars, Windows Menus and Dialog Boxes.	8

Text Books:

1. Patrick Naughton and Herbertz Schildt, "Java-2 The Complete Reference", McGraw Hill.
2. Ivor Horton, "Beginning Java-2", Wiley Publishing.
3. Bala guru swamy, "Programming with Java: A Primer", Tata McGraw Hill Education

Reference

1. Horetmann Cay and Cornell Gary, "Core Java Volume – I", Pearson Education.

Evaluation/Assessment Methodology

	Max. Marks100
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	10
5) ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Able to understand the use of OOPs concepts.
CO2: Able to solve real world problems using OOP techniques.
CO3: Able to understand the use of Packages, Interfaces, abstraction, Exceptions and threading concepts in Java
CO4: Able to understand the use of I/O and GUI programming in java.
CO5: Able to develop and understand database applications and Swing programming in Java.

Format-3

IIMT UNIVERSITY
Year – I /Semester – II

Programme: Degree **Class: MCA**		**Year :** I **Semester: II**
Credits Theory:4Cr	**Subject:** Operating system	
Course Code: **MCA - 123**	**Title :**Operating system	

Course Objectives:
CO 1: Explain main components, services, types and structure of Operating Systems.
CO2: Apply the various algorithms and techniques to handle the various concurrency control issues.
CO3: Compare and apply various CPU scheduling algorithms for process execution.
CO4: Identify occurrence of dead lock and describe ways to handle it.
CO5: Explain and apply various memory, I/O and disk management techniques.

Nature of Paper: CORE

Minimum Passing Marks/Credits:40% Marks

L:3
T:1
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction**: Operating System Structure-Layered structure, System Components, Operating system functions, Classification of Operating systems-Batch, Interactive, Time-sharing, Real-Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems, Multithreaded Systems, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	8
II	**Concurrent Processes**: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation, Classical Problem in Concurrency-Dining Philosopher Problem, Sleeping Barber Problem, Inter Process Communication models and Schemes, Process generation.	8
III	**CPU Scheduling:** Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Dead lock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from dead lock.	8
IV	**Memory Management:** Basic bare machine, Resident monitor, Multi programming with fixed partitions, Multi programming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	8
V	**I/O Management and Disk Scheduling**: I/O devices, and I/O sub systems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept,	8

	File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	

Text Books:

1. Silberschatz, Galvinand Gagne, "Operating Systems Concepts", Wiley Publication.
2. Sibsankar Halder and Alex A Arvind, "Operating Systems", Pearson Education

Reference

1. Harvey M Dietel, "An Introduction to Operating System", Pearson Education.
2. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson Education.

Evaluation/Assessment Methodology

	Max. Marks100
1) Class tasks/ Sessional Examination 2) Presentations /Seminar 3)Assignments 4)Research Project Report Seminar On Research Project Report 5) ESE	20 10 70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Describe the important computer system resources and the role of operating system in their management policies and algorithms.

CO2: Understand the process management policies and scheduling of processes by CPU.

CO3: Evaluate the requirement for process synchronization and coordination handled by operating system.

CO4: Describe and analyze the memory management and its allocation policies.

CO5: Identify use and evaluate the storage management policies with respect to different storage management technologies.

Format-3

IIMT UNIVERSITY
Year-I / Semester-II

Programme: Degree **Class: MCA**	**Year: I** **Semester: II**
Credits Theory:4Cr	**Subject:**DATA BASE MANAGEMENT SYSTEM
Course Code: **MCA- 124**	**Title:**DATA BASE MANAGEMENT SYSTEM

Course Objectives:

CO 1: Explain the concept of features of a database system and its application and compare various types of data models.
CO 2: Describe the E-R Models and Relational Database.
CO 3: Explain the concept of SQL Commands, relational algebra, tuple calculus and domain calculus.
CO 4: Explain the need of normalization and normalize a given relation to the desired normal form.
CO 5: Analyze the different approaches of transaction processing and concurrency control.

Nature of Paper: CORE

Minimum Passing Marks/Credits:40% Marks

L:3
T:1
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Overview, Database System vs File System, Data base System Concept and Architecture, Data Model Schema and Instances, Data Independence and Data base Language and Interfaces, Data Definitions Language, DML, Overall Data base Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	8
II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction to SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less joined compositions, normalization using FD, MVD, and JDs,	8

	alternative approaches to data base design	
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Dead lock Handling. Distributed Data base: Distributed Data Storage, Concurrency Control, Directory System.	8
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	8

Text Books:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill.
2. Date C J, "An Introduction to Database Systems", Addision Wesley.
3. Elmasri, Navathe, "Fundamentals of Database Systems", Addision Wesley.
4. O'Neil, "Databases", Elsevier Pub

Reference

1. Ramakrishnan, "Database Management Systems", McGraw Hill.
2. Leon & Leon, "Database Management Systems", Vikas Publishing House.
3. Bipin C. Desai, "An Introduction to Database Systems", Gagotia Publications.
4. Majumdar& Bhattacharya, "Database Management System", McGraw Hill.

Evaluation/Assessment Methodology

	Max. Marks100
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	75
Total:	100

Prerequisites for the course: SQL

Course Learning Outcomes:

CO1: Describe the features of a database system and its application and compare various types of data models.

CO2: Construct an ER Model for a given problem and transform it into a relation database schema.

CO3: Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.

CO4: Explain the need of normalization and normalize a given relation to the desired normal form.

CO5: Explain different approaches of transaction processing and concurrency control.

Format-3

IIMT UNIVERSITY
Year-I / Semester-II

Programme: Degree **Class: MCA**	**Year: I** **Semester: II**
Credits Theory:4Cr	**Subject:**Data structure and analysis of algorithms
Course Code: **MCA- 125**	**Title:**Data structure and analysis of algorithms

Course Objectives:

CO 1: Explain the concept of data structure, abstract data types, algorithms, analysis of algorithms and basic data organization schemes such as arrays and linked lists.

CO 2: Describe the applications of stacks and queues and implement various operations on the musing arrays and linked lists.

CO 3: Describe the properties of graphs and trees and implement various operations such as searching and traversal on them.

CO 4: Compare incremental and divide-and-conquer approaches of design in gal gorithms for problems such assorting and searching.

CO 5: Apply and analyze various design approaches such as Divide-and-Conquer, greedy and dynamic for problem solving.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks

L:4
T:0
P:0(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to data structure:** Data, Entity, Information, Difference between Data and Information, Data type, Build in data type, Abstract data type, Definition of data structures, Types of Data Structures: Linear and Non-Linear Data Structure, Introduction to Algorithms: Definition of Algorithms, Difference between algorithm and programs, properties of algorithm, Algorithm Design Techniques, Performance Analysis of Algorithms, Complex it y of various code structures, Order of Growth, Asymptotic Notations. **Arrays:** Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D Array Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction &Multiplications of Single variable.	8
II	**Stacks**: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and	8

	Postfix Expressions, Evaluation of post fix expression, Iteration and Recursion-Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. **Queues:** Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue. **Searching:** Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing &Collisionre solution Techniques used in Hashing.	
III	**Sorting:** Insertion Sort, Selection Sort, Bubble Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time: Counting Sort and Bucket Sort. **Graphs:** Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, ConnectedComponent.	8
IV	**Trees:** Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer (Linked List) Representation, Binary Search Tree, Complete Binary Tree, A Extended Binary Trees, Tree Traversal algorithms: In order, Preorder and Post order, Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching &Modification of data in Binary Search Tree. Threaded Binary trees, Huffman coding using Binary Tree, AVL Tree and BTree.	8
V	Divide and Conquer with Examples Such as Merge Sort, Quick Sort, Matrix Multiplication: Strassen's Algorithm Dynamic Programming: Dijikstra Algorithm, Bell man Ford Algorithm, All-pair Shortest Path: Warshal Algorithm, Longest Common Sub-sequence Greedy Programming: Primsand Kruskal algorithm.	8

Text Books:

1. Cormen T.H., Leiserson C.E., Rivest R.L., and Stein C., "Introduction to Algorithms", PHI.
2. Horowitz Ellis, Sahni Sartaj and Rajasekharan S., "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.

Reference

1. Lipschutz, Data Structures With C-SIE-SOS, McGraw Hill.
2. Samanta D., "Classic Data Structures", 2nd Edition Prentice Hall India.

Evaluation/Assessment Methodology

	Max. Marks100
1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
Seminar On Research Project Report	
5) ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Understand the concept of data structure and various algorithms.
CO2: Able to analyze the performance of algorithms.
CO3: Understand which algorithm or data structure to use in different scenarios.
CO4: Use various data structures effectively in application programs.
CO5: Understand various types of sorting and their algorithms

Format-3

IIMT UNIVERSITY
Year- I / Semester –II

Programme: Degree **Class: MCA**	Year: I Semester: II
Credits: Practical: 2	**Subject: OOPS USING JAVA LAB**
Course Code: **MCA-126P**	**Title: OOPS USING JAVA LAB**

Course Objectives:
CO1: To write GUI programs using swing in java.
CO2: To write programs implementing OOPS concepts.
CO3: To write programs based on real world problems using java collection frame work.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks

L:0
T:0
P:4(In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Write a program to enter a number from user and print the odd numbers between 1 to that number.	2
II	Write a Program to find perimeter of square if area is entered by user.	2
III	Write a program to handle Array indexOutOfBounds exception.	2
IV	Write a Java program to copy an array by iterating the array.	2
V	Write a program to demonstrate a divide by zero program exception.	2
VI	Write a Java program to get the character at the given index within the String.	2
VII	Write a program to find the sum of each row of a matrix.	2
VIII	Write a program to find area of rectangle using parameterized constructor.	2

Reference / Text Books:

1. Patrick Naughton and Herbertz Schildt, “Java-2 The Complete Reference”, Mc. Graw Hill.
2. Balaguruswamy, “Programming with Java: A Primer”, Tata McGraw Hill Education.

Evaluation/Assessment Methodology

Max. Marks:50

1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report/Seminar On Research Project Report	
5) ESE	30
Total:	50

Course Learning Outcomes: Student will be able to:
CO1: Write programs based on real world problems using java collection frame work...
CO2: Write GUI programs using swing in java.
CO3: Implement OOPS concepts.

Format-3

IIMT UNIVERSITY
Year-I / Semester-II

Programme: Degree **Class: MCA**	Year: I Semester: II
Credits Practical: 2	**Subject: Data Base Management System Lab**
Course Code: **MCA-127P**	**Title: Data Base Management System Lab**

Course Objectives:

To learn the student should be made to:

CO1: Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.

CO2: Be familiarized with a query language

CO3: Have hands on experience on DDL Commands

CO4: Have a good understanding of DML Commands and DCL commands

CO5: Familiarize advanced SQL queries and exposed to different applications

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks

L:0
T:0
P:4 (In Hours/Week)
Theory - 1 Hr. = 1 Credit
Practical- 2 Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Creation of a database and writing SQL queries to retrieve information from the database.	2
II	Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.	2
III	Perform the following: a. Viewing all databases, creating a Database, Viewing all Tables in a Database, Creating Tables (With and Without Constraints), Inserting/Updating/Deleting b. Records in a Table, Saving (Commit) and Undoing (rollback).	2
IV	Perform the following: a. Altering a Table, Dropping/Truncating/Renaming Tables, backing up / restoring a Database.	2
V	For a given set of relation schemes, create tables and perform the following Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions, Math Functions Join Queries- Inner Join, Outer Join Sub queries- With IN clause, With EXISTS clause.	2
VI	For a given set of relation tables perform the following a. Creating Views (with and without check option), Dropping views,	2

	Selecting from view.	
VII	Write a Pl/SQL program using FOR loop to insert ten rows into a database table.	2
VIII	Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, Dept ID) write a cursor to select the five highest paid employees from the table.	2

Reference / Text Books:

1. Fundamentals of Database System ByElmasari& Navathe, 7th Edition, 2018, Pearson Education.
2. Database System Concepts by Silberschatz, Korth & Sudarshan, 6th Edition, 2019, McGraw-Hill Education.

Evaluation/Assessment Methodology

Max. Marks:50

1) Class tasks/ Sessional Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report Seminar On Research Project Report	
5) ESE	30
Total:	50

Course Learning Outcomes:

Student will be able to:

CO1: Design and implement a database schema for a given problem-domain

CO2: Populate and query a database

CO3: Create and maintain tables using PL/SQL.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:** MCA	**Year:** II **Semester:** III
Credits Theory:4Cr	**Subject:** Artificial Intelligence
Course Code: MCA-231	**Title:** Artificial Intelligence

Course Objectives:

CO1: Define the meaning of intelligence and study various intelligent agents.
CO2 Understand, analyze and apply AI searching algorithms in different problem domains.
CO3: Study and analyze various models for knowledge representation.
CO4: Understand the basic concepts of machine learning to analyze and implement widely used learning methods and algorithms.
CO5: Understand the concept of pattern recognition and evaluate various classification and clustering techniques

Nature of Paper: Core Course

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:1
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Artificial Intelligence:** Introduction to artificial intelligence, Historical development and foundation areas of artificial intelligence, Tasks and application areas of artificial intelligence. Introduction, types and structure of intelligent agents, Computer Vision, Natural language processing.	**08**
II	**Searching Techniques:** Introduction, Problem solving by searching, Searching for solutions, Uniformed searching techniques, Informed searching techniques, Local search algorithms, Adversarial search methods, Search techniques used in games, Alpha-Beta pruning.	**08**
III	**Knowledge Representation and Reasoning:** Propositional logic, Predicate logic, First order logic, Inference in first order logic, Clause form conversion, Resolution. Chaining- concept, forward chaining and backward chaining, Utility theory and Probabilistic reasoning, Hidden Markov model, Bayesian networks.	**08**
IV	**Machine Learning:** Introduction, types and application areas, Decision trees, Statistical learning methods, Learning with complete data - concept and Naïve Bayes models, Learning with hidden data- concept and EM algorithm, Reinforcement learning.	**08**
V	**Pattern Recognition:** Introduction and design principles, Statistical pattern recognition, Parameter estimation methods - Principle component analysis and Linear discrimination analysis, Classification techniques - Nearest neighbor	**08**

	rule and Bayes classifier, K-means clustering, Support vector machine.	

Text Book:

1. Russell S. and Norvig P., "Artificial Intelligence – A Modern Approach", Pearson Education.
2. Rich E. and Knight K., "Artificial Intelligence", McGraw Hill Publications.
3. Charnik E. and McDermott D., "Introduction to Artificial Intelligence", Pearson Education.
4. Patterson D. W., "Artificial Intelligence and Expert Systems", Prentice Hall of India Publications.

Reference Book:

1. Khemani D., "A First Course in Artificial Intelligence", McGraw Hill.
2. Winston P. H., "Artificial Intelligence", Pearson Education.
3. Thornton C. and Boulay B.," Artificial Intelligence- Strategies, Applications and Models through Search", New Age International Publishers.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Demonstrate fundamental understanding of the history of artificial intelligence.

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

CO4: Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.

CO5: Demonstrate proficiency in applying scientific method to models of machine learning.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year:** II **Semester:**III
Credits Theory:4Cr	**Subject:**Software Engineering
Course Code: MCA-232	**Title:**Software Engineering

CourseObjectives:

CO1: Explain various software characteristics and analyze different softwareDevelopment Models.
CO2 Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards.
CO3: Compare and contrast various methods for software design.
CO4: Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing.
CO5: Manage software development process independently as well as in teams and make use of various software management toolsfordevelopment, maintenance and analysis.

Nature of Paper: Core Course

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:1
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	**08**
II	**Software Requirement Specifications (SRS):** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	**08**
III	**Software Design:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top- Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	**08**

IV	**Software Testing:** Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top Down and Bottom- Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	**08**
V	**Software Maintenance and Software Project Management:** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	**08**

Text Book:

1. R S Pressman, "Software Engineering: A Practitioners Approach", McGraw Hill.
2. Pankaj Jalote, "Software Engineering", Wiley
3. Rajib Mall, "Fundamentals of Software Engineering", PHI Publication.
4. KK Aggarwal and Yogesh Singh,"Software Engineering", New Age International Publishers.

Reference Book:

1. Ghezzi, M. Jarayeri, D. Manodrioli, "Fundamentals of Software Engineering", PHI Publication.
2. I an Sommerville, "Software Engineering", Addison Wesley.
3. Kassem Saleh, "Software Engineering", Cengage Learning
4. Pfleeger, "Software Engineering", Macmillan Publication

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/SessionalExamination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Plan a software engineering process life cycle , including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements

CO2: Able to elicit, analyze and specify software requirements through a productive working relationship with various take holders of the project

CO3: Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.

CO4: Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice

CO5: Able to use modern engineering tools necessary for software project management, time management and software reuse.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year:** II **Semester:**III
Credits Theory:4Cr	**Subject:**Computer Networks
Course Code: MCA-233	**Title:**Computer Networks

Course Objectives:

CO1: Describe communication models TCP/IP, ISO-OSI model, network topologies along with communicating devices and connecting media.

CO2: Apply knowledge of error detection, correction and learn concepts of flow control along with error control.

CO3: Classify various IP addressing techniques, subnetting along with network routing protocols and algorithms.

CO4: Understand various transport layer protocols and their design considerations along with congestion control to maintain Quality of Service.

CO5: Understand applications-layer protocols and elementary standards ofcryptography and network security.

Nature of Paper: Core Course

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:4
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Data Communications**: Introduction: Data communication Components and characteristics, Data representation and Dataflow. **Networks:** LAN, WAN, MAN, Topologies. **Protocols and Standards**: ISO-OSI model and TCP-IP Model. **Network Connecting Devices:** HUB, Bridge, Switch, Router and Gateways. **Transmission Media:** Guided and unguided Media **Classification and Arrangement:** Wired LANs and Wireless LANs	**08**
II	**Data Link Layer:** **Error Detection and Error Correction:** Types of errors, LRC, VRC, Checksum, CRC, and Hamming Code. **Flow Control and Error Control:** Stop and Wait Protocol, Sliding Window, Go-back-N-ARQ Protocol and Selective-Repeat ARQ Protocol. **Channel Allocation Protocols:** Random Access, Controlled and Channelization techniques such as ALOHA, CSMA, CSMA/CD, CDMA/CA, TDMA, FDMA, Token Passing, etc.	**08**
III	**Network Layer:** **Switching Techniques:** Circuit Switching, Packet Switching, and Message Switching.	**08**

	Logicaladdressing: IPv4 and IPv6 Address schemes, Classes and subnetting **Network Layer Protocols:** ARP, RARP, BOOTP and DHCP **Routing Techniques:** Interdomain and Intradomain routing with examples.	
IV	**Transport Layer:** **Introduction to Transport Layer**: Process-to-ProcessDelivery:Reliable and unreliable Connection, Port and Socket Addressing **Transport Layer Protocols with packet formats:** User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Stream Control Transmission Protocol (SCTP). **Congestion Control:** Techniques for handling the Congestion Control. **Quality of Service (QoS):** Flow Characteristics and techniques to improve QoS.	**08**
V	**Application Layer:** **Basic Concept of Application Layer:** Domain Name System, World Wide Web, Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login. **Introduction to Cryptography:** Definition, Goal, Applications, Attacks, Encryption, decryption, public-key and private key cryptography.	**08**

Text Book:

1. Behrouz Forouzan, "Data Communication and Networking", McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Prentice Hall.
3. William Stallings, "Data and Computer Communication", Pearson.

Reference Book:

1. Kurose and Ross, "Computer Networking- A Top-Down Approach", Pearson.
2. Peterson and Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann
3. W. A. Shay, "Understanding Communications and Networks", Cengage Learning.
4. D. Comer, "Computer Networks and Internets", Pearson.
5. Behrou zForouzan, "TCP/IP Protocol Suite", McGraw Hill.

Evaluation/Assessment Methodology

	Max. Marks 100
1) Classtasks/Sessional Examination	15
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
5) Seminar On Research Project Report	
6) ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Understand Basics of Computer Networks and different Transmission Media.
CO2: Differentiate Protocols which play a major role in providing internet effectively.
CO3: Understand various protocol layers and inner operations.
CO4: Understand architectures of network protocols.
CO5: Understand security issues in network protocols.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year:** II **Semester:** III
Credits Theory:4Cr	**Subject:** Cryptography & Network Security
Course Code: MCA-011	**Title:**Cryptography & Network Security

CourseObjectives:

CO1: Understand various security attacks and their protection mechanism.
CO2 Apply and analyze various encryption algorithms.
CO3: Understand functions and algorithms to authenticate messages and study and apply different digital signature techniques.
CO4: Analyze different types of key distributions.
CO5: Study and appraise different IP and system security mechanism.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
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, Feistel structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, Block cipher modes of operations, Triple DES	**08**
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). 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	**08**
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.	**08**
IV	**Key Management and distribution:** Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.	**08**

	Authentication Applications: Kerberos Electronic mail security: pretty good privacy (PGP), S/MIME.	
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.	**08**

Text Book:

1. Stallings W., "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Frouzan B. A., "Cryptography and Network Security", McGraw Hill.

Reference Book:

1. Kahate A., "Cryptography and Network Security", Tata McGraw Hill.

Evaluation/Assessment Methodology

	Max. Marks 100
1) Classtasks/Sessional Examination	15
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
5) Seminar On Research ProjectReport	
6) ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Provide security of the data over the network.
CO2: Do research in the emerging areas of cryptography and network security.
CO3: Implement various networking protocols.
CO4: Protect any network from the threats in the world
CO5: Understand various protocols for network security to protect against the threatsin the networks.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year:** II **Semester:**III
Credits Theory:4Cr	**Subject:**Data Warehousing & Data Mining
Course Code: MCA-012	**Title:**Data Warehousing & Data Mining

Course Objectives:

CO1: Demonstrate knowledge of Data Warehouse and its components.
CO2 Discuss the process of Warehouse Planning and Implementation.
CO3: Discuss and implement various supervised and Non supervised learning algorithms on data.
CO4: Explain the various process of Data Mining and decide best according to type of data.
Explain process of knowledge discovery in database (KDD). Design Data
CO5: Mining model.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Data Warehousing**: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept.	**08**
II	**Data Warehouse Process and Technology:** Warehousing Strategy, Warehouse/management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design	**08**
III	**Data Mining**: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	**08**
IV	**Classification:** Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based	**08**

	Algorithms, Decision Tree-Based Algorithms. **Clustering**: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	
V	**Data Visualization and Overall Perspective**: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	**08**

Text Book:

1. Alex Berson, Stephen J. Smith "Data Warehousing, Data-Mining & OLAP", TMH.
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, "Data Warehousing: Architecture and Implementation",Pearson.
3. I. Singh, "Data Mining and Warehousing", Khanna Publishing House.

Reference Book:

1. Margaret H. Dunham, S. Sridhar,"Data Mining: Introductory and Advanced Topics" Pearson Education 5. Arun K. Pujari, "Data Mining Techniques" Universities Press.
2. Pieter Adriaans, DolfZantinge, "Data-Mining", Pearson Education

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions.
CO2: Understand KDD process for finding interesting pattern from warehouse.
CO3: Remove redundancy and incomplete data from the dataset using data preprocessing methods.
CO4: Characterize the kinds of patterns that can be discovered by association rule mining.
CO5: Develop a data mining application for data analysis using various tools.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:** MCA	**Year:** II **Semester:** III
Credits Theory:4Cr	**Subject:** Software Project Management
Course Code: MCA-013	**Title:** Software Project Management

CourseObjectives:

CO1: Identify project planning objectives, along with various cost/effort estimation models.
CO2 Organize & schedule project activities to compute critical path for risk analysis
CO3: Monitor and control project activities.
CO4: Formulate testing objectives and test plan to ensure good software quality under SEI-CMM
CO5: Configure changes and manage risks using project management tools.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Project Evaluation and Project Planning:** Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation–Strategic program Management – Stepwise Project Planning.	**08**
II	**Project Life Cycle and Effort Estimation:** Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimationtechniques–COSMICFullfunctionpoints–COCOMOII–aParametricProductivity Model.	**08**
III	**Activity Planning and Risk Management:** Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation– Creation of Critical paths – Cost schedules.	**08**
IV	**Project Management and Control:** Framework for Management and control–Collectionofdata–Visualizingprogress–Costmonitoring– EarnedValueAnalysis– Prioritizing Monitoring – Project tracking – Change control SoftwareConfiguration Management – Managing contracts –	**08**

	Contract Management.	
V	**Staffing in Software Projects:** Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – DispersedandVirtualteams–Communicationsgenres–Communicationplans– Leadership.	**08**

Text Book:

1. Bob Hughes, Mike Cotterell and Rajib Mall: "Software Project Management" – Fifth Edition, McGraw Hill,New Delhi,2012.
2. Robert K. Wysocki — "Effective Software Project Management" – Wiley Publication,2011.
3. Walker Royce: — "Software Project Management" - Addison-Wesley,1998.
4. Gopalaswamy Ramesh, — "Managing Global Software Projects" – McGraw Hill Education (India), FourteenthReprint2013.

Reference Book:

1. Koontz Harold &Weihrich Heinz, "Essentials of Management", McGraw Hill 5thEdition2008.
2. Robbins and Coulter, "Management", Prentice Hall of India, 9thedition.
3. James A. F., Stoner, "Management", Pearson Education Delhi.
4. P. D. Chaturvedi, "Business Communication", Pearson Education.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/SessionalExamination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Identify the different project contexts and suggest an appropriate management strategy.
CO2: Practice the role of professional ethics in successful software development.
CO3: Identify and describe the key phases of project management.
CO4: Determine an appropriate project management approach.
CO5: Evaluation of the business context and scope of the project.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:** MCA	**Year: II** **Semester: III**
Credits Theory:4Cr	**Subject:** Cloud Computing
Course Code: MCA-014	**Title:** Cloud Computing

Course Objectives:

CO1: Understand the concepts of Cloud Computing, key technologies, strengths and limitations of cloud computing.
CO2 Develop the ability to understand and use the architecture to computeand storage cloud, service and models.
CO3: Understand the application in cloud computing.
CO4: Learn the key and enabling technologies that help in the development of cloud.
CO5: Explain the core issues of cloud computing such as resource management and security.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing-issues in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.	**08**
II	**Cloud Services:** Types of Cloud services: Software as a Service- Platform as a Service–Infrastructure as a Service-Database as a Service - Monitoring as a Service–Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.	**08**
III	**Collaborating Using Cloud Services:** Email Communication over the Cloud - CRM Management – Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.	**08**
IV	**Virtualization for Cloud:** Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System VM, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, V Mware, Virtual Box, Hyper-V.	**08**
V	**Security, Standards and Applications:** Security in Clouds: Cloud security	**08**

	challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud. Hadoop – Map Reduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine	

Text Book:

1. David E.Y. Sarna, "Implementing and Developing Cloud Application", CRC press2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw-Hill2010.

Reference Book:

1. Haley Beard, "Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited, July2008.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
Seminar On Research Project Report	
5. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Understand the fundamental principles of distributed computing.
CO2: Understand how the distributed computing environments known as Grids can be built from lower level services.
CO3: Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.
CO4: Analyze the performance of Cloud Computing.
CO5: Understand the concept of Cloud Security.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:** MCA	**Year: II** **Semester: III**
Credits Theory:4Cr	**Subject:** Compiler Design
Course Code: MCA-015	**Title:** Compiler Design

Course Objectives:

CO1: Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.

CO2 Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.

CO3: Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.

CO4: Acquire knowledge about run time data structure like symbol table organization and different techniques used in that.

CO5: Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Compiler**: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**08**
II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsingtables.	**08**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that	**08**

	alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions,procedures call, declarations and case statements.	
IV	**Symbol Tables**: Data structure for symbols tables, representing scope information. Run- Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**08**
V	**Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**08**

Text Book:

1. K. Muneeswaran, Compiler Design, First Edition, Oxford University Press.
2. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.
3. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

Reference Book:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Explain the concepts and different phases of compilation with compile time error handling.

CO2: Represent language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language.

CO3: Compare top down with bottom up parsers, and develop appropriate parser to produce parse tree representation of the input.

CO4: Generate intermediate code for statements in high level language.

CO5: Design syntax directed translation schemes for a given context free grammar. generation and techniques used for code optimization.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year: II** **Semester:**III
Credits Theory:4Cr	**Subject:**Web Technology
Course Code: MCA-021	**Title:**Web Technology

Course Objectives:

CO1: Apply the knowledge of HTML and CSS to develop web application and analyze the insights of internet programming to implement complete application over the web.

CO2 Understand, analyze and apply the role of JavaScript in the workings of the web and web applications.

CO3: Understand, analyze and build dynamic web applications using servlet and JSP.

CO4: Develop Spring-based Java applications using Java configuration, XML configuration, annotation-based configuration, beans and their scopes, and properties.

CO5: Develop web application using Spring Boot and REST Ful Web Services

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:1
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Web Page Designing:** Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, HTML-Introduction, HTML Tags, HTML-Grouping Using Div& Span, HTML-Lists, HTML-Images, HTML- Hyperlink, HTML-Table, HTML-I frame, HTML-Form, Introduction of CSS, CSS Syntax, External Style Sheet using < link >, Multiple Style Sheets, Value Lengths and Percentages, CSS-Selectors, CSS-Box Model, Floats, Clear, Introduction to Bootstrap.	**08**
II	**Scripting:** Introduction to JavaScript, Creating Variables in JavaScript, Creating Functions in JavaScript, UI Events, Returning Data from Functions, Working with Conditions, looping in JavaScript, Block Scope Variables, Working with Objects, Creating Object using Object Literals, Manipulating DOM Elements with JavaScript	**08**
III	**Web Application development using JSP & Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with Http Session. Java Server Pages (JSP): Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives ,Custom Tag Libraries.	**08**

IV	**Spring:** Spring Core Basics-Spring Dependency Injection concepts, Introduction to Design patterns, Factory Design Pattern, Strategy Design pattern, Spring Inversion of Control, AOP, Bean Scopes- Singleton, Prototype, Request, Session, Application, Web Socket, Auto wiring, Annotations, Life Cycle Call backs, Bean Configuration styles	**08**
V	**Spring Boot:** Spring Boot- Spring Boot Configuration, Spring Boot Annotations, Spring Boot Actuator, Spring Boot Build Systems, Spring Boot Code Structure, Spring Boot Runners, Logger, BUILDING RESTFUL WEB SERVICES, Rest Controller, Request Mapping, Request Body, Path Variable, Request Parameter, GET, POST, PUT, DELETE APIs, Build Web Applications	**08**

Text Book:

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, "Web Technology and Design" , New Age International
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication

Reference Book:

1. Bhave, "Programming with Java", Pearson Education
2. Hans Bergsten, "Java Server Pages", SPD O'Reilly
3. Naughton, Schildt, "The Complete Reference JAVA2",TMH

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/ Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Students are able to develop a dynamic webpage by the use of java script and DHTML.

CO2: Students will be able to write a well formed / valid XML document.

CO3: Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.

CO4: Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.

CO5: Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year: II** **Semester:**III
Credits Theory:4Cr	**Subject:**Big Data
Course Code: MCA-022	**Title:**Big Data

Course Objectives:

CO1: Demonstrate knowledge of Big Data Analytics concepts and its applications in business.
CO2 Demonstrate functions and components of Map Reduce Framework and HDFS.
CO3: Develop queries in NoSQL environment.
CO4: Explain process of developing Map Reduce based distributed processing applications.
CO5: Explain process of developing applications using HBASE, Hive, Pig etc.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:1
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Big Data**: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processesand tools, analysis vs reporting, modern data analytic tools.	**08**
II	**Hadoop:** History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. **Map-Reduce:** Map-Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reducefeatures, Real-world Map Reduce	**08**
III	**HDFS (Hadoop Distributed File System):** Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: Compression, serialization, Avro and file-based data structures. Hadoop Environment: Setting up a Hadoop cluster, cluster specification, cluster setup and	**08**

	installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	
IV	**Hadoop Eco System and YARN:** Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features – Name Node high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. **NoSQL** Databases: Introduction to NoSQL Mongo DB: Introduction, data types, creating, updating and deleing documents, querying, introduction to indexing, capped collections **Spark**: Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN **SCALA:** Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.	**08**
V	**Hadoop Eco System Frameworks**: Applications on Big Data using Pig, Hive and H Base. **Pig** : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, **Hive** - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. **HBase**– Hbase concepts, clients, example, Hbasevs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, Big Insights and Big Sheets, introduction to Big SQL.	**08**

Text Book:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley.
2. Big-Data Black Book, DT Editorial Services, Wiley.
3. Dirk de Roos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill.

Reference Book:

1. Thomas Erl, Wajid Khattak, Paul Buhler, "Big Data Fundamentals: Concepts, Drivers and Techniques", PrenticeHall.
2. Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley &Sons
3. Arshdeep Bahga, Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ",VPT

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL
Course Learning Outcomes: CO1: Identify Big Data and its Business Implications. CO2: List the components of Hadoop and Hadoop Eco-System CO3: Access and Process Data on Distributed File System CO4: Manage Job Execution in Hadoop Environment CO5: Develop Big Data Solutions using Hadoop Eco System

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year: II** **Semester:**III
Credits Theory:4Cr	**Subject:**Simulation and Modelling
Course Code: MCA-023	**Title:** Simulation and Modelling

CourseObjectives:

CO1: Study the concept of system, its components and types.
CO2 Understand and analyze nature and techniques of major simulation models.
CO3: Study and simulation. Analyze the idea of continuous and discrete system.
CO4: Understand the notion of system dynamics and system dynamicsdiagrams.
CO5: Finding critical path computation and understanding PERT networks

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:1
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	System definition and components, stochastic activities, continuous and discrete systems, System modeling, Types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.	**08**
II	System simulation, Need of simulation, Basic nature of simulation, techniques of simulation, comparison of simulation and analytical methods, types of system Simulation, real time simulation, hybrid simulation, simulation of pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag model, Cobweb model.	**08**
III	Simulation of continuous Systems, analog vs digital simulation, simulation of water reservoir system, simulation of a servo system, simulation of an auto-pilot. Discrete system simulation, fixed time step vs. event-to-event model, generation of random numbers, test of randomness, Monte-Carlo computation vs. stochastic simulation.	**08**
IV	System dynamics, exponential growth models, exponential decay models, logistic curves, system dynamics diagrams, world model.	**08**
V	Simulation of PERT networks, critical path computation, uncertainties in activity duration, resource allocation and consideration, Simulation languages, object oriented simulation	**08**

Text Book:

1. Geoffrey Gordon, “System Simulation”, PHI
2. Narsingh Deo, “System Simulation with digital computer”, PHI.

Reference Book:

1. Averill M. Law and W. David Kelton, "Simulation Modelling and Analysis", TMH.

Evaluation/Assessment Methodology	
	Max. Marks 100
1. Classtasks/SessionalExamination	15
2. Presentations /Seminar	
3. Assignments	
4. ResearchProjectReport	10
5. SeminarOnResearchProjectReport	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Describe the role of important elements of discrete event simulation and modeling paradigm.

CO2: Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.

CO3: Interpret the model and apply the results to resolve critical issues in a real world environment.

CO4: Apply random number variates to develop simulation models

CO5: Analyze output data produced by a model and test validity of the model

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year: II** **Semester:**III
Credits Theory:4Cr	**Subject:** Software Testing & Quality Assurance
Course Code: MCA-024	**Title:** Software Testing & Quality Assurance

Course Objectives:

CO1: Test the software by applying testing techniques to deliver a product free from bugs.
CO2 Investigate the scenario and select the proper testing technique.
CO3: Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.
CO4: Understand how to detect, classify, prevent and remove defects.
CO5: Choose appropriate quality assurance models and develop quality. Ability to conduct formal inspections, record and evaluate results of inspections.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks (ISE+ESE)

L:3
T:1
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Software Testing Basics:** Testing as an engineering activity, Role of process in software quality, Testing as a process, Basic definitions, Software testing principles, The tester's role in a software development organization, Origins of defects, Defect classes, The defect repository and test design, Defect examples, Developer / Tester support for developing a defect repository.	**08**
II	**Testing Techniques and Levels of Testing:** Using White Box Approach to Test design– Static Testing Vs. Structural Testing, Code Functional Testing, Coverage and Control Flow Graphs, Using Black Box Approaches to Test Case Design, Random Testing, Requirements based testing, Decision tables, State-based testing, Cause-effect graphing, Error guessing, Compatibility testing, Levels of Testing -Unit Testing, Integration Testing, Defect Bash Elimination. System Testing - Usability and Accessibility Testing, Configuration Testing, Compatibility Testing.	**08**
III	**Software Test Automation And Quality Metrics:** Software Test Automation, Skills needed for Automation, Scope of Automation, Design and Architecture for Automation, Requirements for a Test Tool, Challenges in Automation Tracking the Bug, Debugging. Testing Software System Security - Six-Sigma, TQM - Complexity Metrics and Models, Quality Management Metrics, Availability Metrics, Defect Removal Effectiveness, FMEA, Quality Function Deployment, Taguchi Quality Loss Function, Cost of Quality.	**08**

IV	**Fundamentals of Software Quality Assurance:** SQA basics, Components of the Software Quality Assurance System, software quality in business context, planning for software quality assurance, product quality and process quality, software process models, 7 QC Tools and Modern Tools.	**08**
V	**Software Assurance Models:** Models for Quality Assurance, ISO-9000 series, CMM, CMMI, Test Maturity Models, SPICE, Malcolm Baldrige Model- P- CMM. **Software Quality Assurance Trends:** Software Process- PSP and TSP, OO Methodology, Clean room software engineering, Defect Injection and prevention, Internal Auditing and Assessments, Inspections & Walkthroughs, Case Tools and their affect on Software Quality.	**08**

Text Book:

1. Aditya P. Mathur, "Foundations of Software Testing", Pearson.
2. Paul Ammann, Jeff Offutt, "Introduction to Software Testing", Cambridge University Press.
3. Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", Auerbach Publications.
4. William Perry, "Effective Methods of Software Testing", Wiley Publishing, Third Edition.

Reference Book:

1. RenuRajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGrawHill.
2. Stephen Kan, "Metrics and Models in Software Quality", Addison – Wesley, Second Edition.
3. S. A. Kelkar, "Software quality and Testing", PHI Learning Pvt, Ltd.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Students learn to apply software testing knowledge and engineering methods

CO2: Students understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods

CO3: Students analyze and understand the use of software testing methods and modern software testing tools for their testing projects

CO4: Students identify defects and manage those defects for improvement in quality for given

CO5: Software Choose appropriate quality assurance models and develop quality. Ability to conduct formal inspections, record and evaluate results of inspections.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA	**Year: II** **Semester:** III
Credits Theory:4Cr	**Subject:**Digital Image Processing
Course Code: MCA-025	**Title:**Digital Image Processing

Course Objectives:

CO1: Explain the basic concepts of two-dimensional signal acquisition, sampling, quantization and color model.
CO2 Apply image processing techniques for image enhancement in both the spatialand frequency domains.
CO3: Apply and compare image restoration techniques in both spatial and frequency domain.
CO4: Compare edge based and region based segmentation algorithms for ROIextraction.
CO5: Explain compression techniques and descriptors for image processing.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:1
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Digital Image Fundamentals:** Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition– Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.	**08**
II	**Image Enhancement:** Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.	**08**
III	**Image Restoration:** Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics –Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	**08**
IV	**Image Segmentation:** Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.	**08**

V	**Image Compression and Recognition:** Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes –Recognition based on matching.	**08**

Text Book:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson, Third Edition, 2010.
2. Anil K. Jain, "Fundamentals of Digital Image Processing", Pearson, 2002.
3. Kenneth R. Castleman, "Digital Image Processing" Pearson, 2006.

Reference Book:

1. D, E. Dudgeon and R M. Mersereau, "Multidimensional Digital Signal Processing", Prentice Hall Professional Technical Reference, 1990.
2. William K. Pratt, "Digital Image Processing" John Wiley, New York,2002.
3. Milan Sonka et al, "Image processing, analysis and machine vision Brookes/Cole", Vikas Publishing House, 2nd edition, 1999.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	15
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	75
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Review the fundamental concepts of a digital image processing system.
CO2: Analyze images in the frequency domain using various transforms.
CO3: Evaluate the techniques for image enhancement and image restoration.
CO4: Categorize various compression techniques.
CO5: Interpret Image compression standards.

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:**MCA		**Year: II** **Semester:**III
Credits Theory:2Cr	**Subject:**Artificial Intelligence Lab	
Course Code: MCA-231P	**Title:**Artificial Intelligence Lab	

Course Objectives:

CO1:	Study and understand AI tools such as Python / MATLAB.
CO2	Apply AI tools to analyze and solve common AI problems.
CO3:	Implement and compare various AI searching algorithms.
CO4:	Implement various machine learning algorithms.
CO5:	Implement various classification and clustering techniques.

Nature of Paper: Core

Minimum Passing Marks/Credits:50% Marks (ISE+ESE)

L:0
T:0
P:4(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
	1. Installation and working on various AI tools such as Python /MATLAB.	**02**
	2. Programs to solve basic AI problems.	**02**
	3. Implementation of different AI searching techniques.	**02**
	4. Implementation of different game playing techniques.	**02**
	5. Implementation of various knowledge representation techniques.	**02**
	6. Program to demonstrate the working of Bayesiannet work.	**02**
	7. Implementation of pattern recognition problems such as handwritten character/ digit recognition, speech recognition, etc.	**02**
	8. Implementation of different classification techniques.	**02**
	9. Implementation of various clustering techniques.	**02**
	10. Natural language processing tool development	**02**

Text Book:

1. Russell S. and Norvig P., "Artificial Intelligence – A Modern Approach", PearsonEducation.
2. Rich E. and Knight K., "Artificial Intelligence", McGraw Hill Publications.

Reference Book:
Book:

1. Khemani D., "A First Course in Artificial Intelligence", McGrawHill.

Evaluation/Assessment Methodology	
	Max. Marks 100
1. Class tasks/Sessional Examination 2. Presentations /Seminar 3. Assignments 4. Research Project Report 5. Seminar On Research Project Report 6. ESE	25 25
Total:	50
Prerequisites for the course: NIL	
Course Learning Outcomes: CO1: Demonstrate understand AI tools such as Python / MATLAB. CO2: Apply various pre-processing techniques on different datasets. CO3: Construct Machine learning programs for Supervised, Unsupervised and Semisupervised learning models. CO4: Develop Deep learning programs for Supervised & Unsupervised learning models. CO5: Implement various classification and clustering techniques.	

Format-3

IIMT UNIVERSITY
Year-II/Semester-III

Programme: Degree **Class:** MCA	**Year: II** **Semester: III**
Credits Theory:2Cr	**Subject:** Software Engineering Lab
Course Code: MCA-232P	**Title:** Software Engineering Lab

Course Objectives:

CO1:	Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement.
CO2	Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship.
CO3:	Draw a class diagram after identifying classes and association among them.
CO4:	Graphically represent various UML diagrams and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially.
CO5:	Able to use modern engineering tools for specification, design, implementation and testing.

Nature of Paper: Core

Minimum Passing Marks/Credits: 50% Marks (ISE+ESE)

L:0
T:0
P:4(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
	1. Prepare a SRS document in line with the IEEE recommended standards.	02
	2. Draw the use case diagram and specify the role of each of theactors.	02
	3. Prepare state the precondition, post condition and function of each use case.	02
	4. Draw the activitydiagram.	02
	5. Identify the classes. Classify them as weak and strong classes and drawthe class diagram.	02
	6. Draw the sequence diagram for any two scenarios.	02
	7. Draw the collaboration diagram.	02
	8. Draw the state chart diagram.	02
	9. Draw the component diagram.	02
	10. Draw the deployment diagram.	02

Text Book:

1. R S Pressman, “Software Engineering: A Practitioners Approach”, McGraw Hill.
2. Pankaj Jalote, “Software Engineering”, Wiley

Reference Book:
Book:

1. Ghezzi, M. Jarayeri, D. Manodrioli, “Fundamentals of Software Engineering”, PHI Publication.
2. Ian Sommerville, “Software Engineering”, Addison Wesley.

Evaluation/Assessment Methodology	
	Max. Marks 100
1. Class tasks/Sessional Examination 2. Presentations /Seminar 3. Assignments 4. Research Project Report 5. Seminar On Research Project Report 6. ESE	25 25
Total:	50
Prerequisites for the course: NIL	

Course Learning Outcomes:

CO1: Able to prepare SRS document, design document, test cases and software configuration management and risk management related document.

CO2: Develop function oriented and object oriented software design using tools like rational rose.

CO3: Able to perform unit testing and integration testing.

CO4: Apply various white box and black box testing techniques

CO5: Able to track the progress of a project using Open projtool.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject :**Privacy and Security in Online Social Media
Course Code: MCA-031	**Title:** Privacy and Security in Online Social Media

Course Objectives:

CO1: Understand working of online social networks
CO2 Describe privacy policies of online social media
CO3: Analyse countermeasures to control information sharing in Online social networks.
CO4: Apply knowledge of identity management in Online social networks
CO5: Compare various privacy issues associated with popular social media.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Online Social Networks:** Introduction to Social Networks, From offline to Online Communities, Online Social Networks, Evolution of Online Social Networks, Analysis and Properties, Security Issues in Online Social Networks, Trust Management in Online Social Networks, Controlled Information Sharing in Online Social Networks, Identity Management in Online Social Networks, data collection from social networks, challenges, opportunities, and pitfalls in online social networks, APIs; Collecting data from Online Social Media.	**08**
II	**Trust Management in Online Social Networks:** Trust and Policies, Trust and Reputation Systems, Trust in Online Social, Trust Properties, Trust Components, Social Trust and Social Capital, Trust Evaluation Models, Trust, credibility, and reputations in social systems; Online social media and Policing, Information privacy disclosure, revelation, and its effects in OSM and online social net works; Phishing in OSM & Identifying fraudulent entities in online social networks	**08**
III	**Controlled Information Sharing in Online Social Networks:** Access Control Models, Access Control in Online Social Networks, Relationship-Based Access Control, Privacy Settings in Commercial Online Social Networks, Existing Access Control Approaches	**08**
IV	**Identity Management in Online Social Networks:** Identity Management, Digital Identity, Identity Management Models: From Identity 1.0 to Identity	**08**

	2.0, Identity Management in Online Social Networks, Identity as Self-Presentation, Identity thefts, Open Security Issues in Online Social Networks	
V	**Case Study:** Privacy and security issues associated with various social media such as Facebook, Instagram, Twitter, LinkedIn etc.	**08**

Text Book:

1. Security and Privacy-Preserving in Social Networks, Editors: Chbeir, Richard, Al Bouna, Bechara (Eds.), Spinger, 2013.
2. Security and Trust in Online Social Networks, Barbara Carminati, Elena Ferrari, Marco Viviani, Morgan & Clay pool publications.
3. Security and Privacy in Social Networks, Editors: Altshuler, Y., Elovici, Y., Cremers, A.B., Aharony, N., Pentland, A. (Eds.), Springer,2013

Reference Book:

1. Security and privacy preserving in social networks, Elie Raad & Richard Chbeir, Richard Chbeir & Bechara Al Bouna,2013
2. Social Media Security: Leveraging Social Networking While Mitigating Risk, Michael Cross, 2013.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Able to understand working of online social networks
CO2: Describe privacy policies of online social media
CO3: Analyse countermeasures to control information sharing in Online social networks.
CO4: Apply knowledge of identity management in Online social networks
CO5: Compare various privacy and security issues associated with popular social media.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:**MCA	**Year: II** **Semester:** IV
Credits Theory:3Cr	**Subject:**Soft Computing
Course Code: MCA-032	**Title:**Soft Computing

Course Objectives:

CO1: Recognize the need of soft computing and study basic concepts and techniques of soft computing.
CO2 Understand the basic concepts of artificial neural network to analyze widely used neural networks.
CO3: Apply fuzzy logic to handle uncertainty in various real-world problems.
CO4: Study various paradigms of evolutionary computing and evaluate genetic algorithm in solving optimization problems.
CO5: Apply hybrid techniques in applications of soft computing.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Soft Computing:** Introduction, Comparison with hard computing, Concept of learning and adaptation, Constituents of soft computing, Applications of soft computing. **Artificial Neural Networks:** Basic concepts of neural networks, Human brain, Biological neural network, History of artificial neural networks, Basic building blocks of an artificial neuron, Neural network architectures, Activation functions, Characteristics and limitation of neural networks.	**08**
II	**Artificial Neural Networks:** Learning methods - Supervised, Unsupervised, Reinforcement, Hebbian, Gradient descent, Competitive, Stochastic. **Major classes of neural networks:** Perceptron networks, Multilayer perceptron model, Back-propagation network, Radial basis function network, Recurrent neural network, Hopfield networks, Kohonen self-organizingfeature maps.	**08**
III	**Fuzzy Logic:** Introduction to Fuzzy Logic, Comparison with crisp logic, Properties of classical sets, Operations on classical sets, Properties of fuzzy sets, Operations on fuzzy sets, Classical relations, Fuzzy relations, Features and types of fuzzy membership functions, Fuzzy arithmetic, Fuzzy measures. **Fuzzy Systems:** Crisp logic, Predicate logic, Fuzzy logic, Fuzzy propositions, Inference rules, Fuzzy inference systems- Fuzzification, Inference, Defuzzification, Types of inference engines.	**08**

IV	**Evolutionary Computing:** Introduction, Evolutionary algorithm, Biological evolutionary process, Paradigms of evolutionary computing – Genetic algorithm and Genetic programming, Evolutionary strategies, Evolutionary programming. **Genetic Algorithm:** Introduction, Traditional optimization and search techniques, Comparison with traditional algorithms, Operations- Encoding, Selection, Crossover and Mutation, Classification of Genetic algorithm.	**08**
V	**Hybrid Soft Computing Techniques:** Introduction, Classification of hybrid systems, Neuro-fuzzy hybrid systems, Neuro-genetic hybrid systems, Fuzzy-genetic hybrid systems. **Other Soft Computing Techniques:** Tabu Search, Ant colony based optimization, Swarm Intelligence.	**08**

Text Book:

1. Sivanandam S.N. and Deepa S.N., "Principles of Soft Computing", Wiley-India.
2. Rajasekaran S. and Vijayalakshmi Pai G.A., "Neural Networks, Fuzzy Logic and Genetic Algorithms- Synthesis and Applications", PHILearning.
3. Chakraverty S., Sahoo D.M. and Mahato N. R., "Concepts of Soft Computing- Fuzzy and ANN with Programming",Springer.

Reference Book:

1. Kaushik S. and Tiwari S., "Soft Computing – Fundamentals, Techniques and Applications', McGrawHill Education.
2. Jang J.-S.R., Sun C.-T. andMizutani E., "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/SessionalExamination	20
2. Presentations /Seminar	
3. Assignments	
4. ResearchProjectReport	10
5. SeminarOnResearchProjectReport	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Recognize the need of soft computing and study basic concepts and techniques of soft computing.

CO2: Apply neural networks, bidirectional associative memories and adaptive resonance theory for solving different engineering problems

CO3: Identify and describe soft computing techniques and build supervised learning and unsupervised learning networks.

CO4: Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering

CO5: problems.
Evaluate and compare solutions by various soft computing approaches for a given problem.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Pattern Recognition
Course Code: MCA-033	**Title:** Pattern Recognition

Course Objectives:

CO1: Study of basics of Pattern recognition. Understand the designing principles and Mathematical foundation used in pattern recognition.
CO2 Analysis the Statistical Patten Recognition.
CO3: Understanding the different Parameter estimation methods.
CO4: Understanding the different Nonparametric Techniques.
CO5: Understand and Make use of unsupervised learning and Clustering in Pattern recognition.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.	**08**
II	**Statistical Patten Recognition:** Bayesian Decision Theory, Classifiers, Normal density and discriminant functions	**08**
III	**Parameter estimation methods:** Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.	**08**
IV	**Nonparametric Techniques:** Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzyclassification.	**08**
V	**Unsupervised Learning & Clustering:** Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.	**08**

Text Book:

1. Duda R. O., Hart P. E. and Stork D. G., "Pattern Classification", John Wiley.
2. Bishop C. M., "Neural Network for Pattern Recognition", Oxford University Press.

Reference Book:

1. Singhal R., "Pattern Recognition: Technologies & Applications", Oxford University Press. 2. Theodoridis S. and Koutroumbas K., "Pattern Recognition", Academic Press.	
Evaluation/Assessment Methodology	
	Max. Marks 100
1. Class tasks/Sessional Examination 2. Presentations /Seminar 3. Assignments 4. Research Project Report 5. Seminar On Research Project Report 6. ESE	20 10 70
Total:	100
Prerequisites for the course: NIL	
Course Learning Outcomes: CO1: Study of basics of Pattern recognition. Understand the designing principles and Mathematical foundation used in pattern recognition. CO2: Outline basic concepts of pattern recognition. CO3: Classify decision-making algorithms in pattern recognition. CO4: Apply Hierarchical and Partition clustering techniques in pattern recognition applications. CO5: Analyze feature selection algorithms in pattern recognition.	

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Data Analytics
Course Code: MCA-034	**Title:** Data Analytics

Course Objectives:

CO1: Describe the life cycle phases of Data Analytics through discovery, planning and building.
CO2 Understand and apply Data Analysis Techniques.
CO3: Implement various Data streams.
CO4: Understand item sets, Clustering, frame works & Visualizations.
CO5: Apply R tool for developing and evaluating real time applications.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Data Analytics**: Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. **Data Analytics Lifecycle**: Need, key roles for successful analytic projects, various phases of data analytics lifecycle – discovery, data preparation, model planning, model building, communicating results, operationalization	**08**
II	**Data Analysis:** Regression modeling, multivariate analysis, Bayesian modeling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction, Neural Networks: Learning and generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic search methods.	**08**
III	**Mining Data Streams:** Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications, Case studies – Real time sentiment analysis, stock market predictions.	**08**
IV	**Frequent Itemsets and Clustering:** Mining frequent itemsets, market based	**08**

	modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, counting frequent itemsets in a stream, Clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.	
V	**Frame Works and Visualization**: Map Reduce, Hadoop, Pig, Hive, H Base, Map R, Sharding, NoSQL Databases, S3, Hadoop Distributed File Systems, Visualization: visual data analysis techniques, interaction techniques, systems and applications. **Introduction to R** - R graphical user interfaces, data import and export, attribute and data types, descriptive statistics, exploratory data analysis, visualization before analysis, analytics for unstructured data.	**08**

Text Book:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press.

Reference Book:

1. Bill Franks, "Taming the Big Data Tidalwave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & Sons.
2. John Garrett, "Data Analytics for IT Networks : Developing Innovative Use Cases", Pearson Education.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Understand the concepts of visualization.
CO2: Explain and Analyse the Big Data using Map-reduce programming in Both Hadoop and Spark frame work.
CO3: Demonstrate spark programming and graph algorithms using programming languages.
CO4: Analyse and implement different frame work tools by taking sample data sets.
CO5: Ilustrate and implement the concepts by taking an application problem

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:**MCA	**Year: II** **Semester:**IV
Credits Theory:3Cr	**Subject:** Software Quality Engineering
Course Code: MCA-035	**Title:** Software Quality Engineering

Course Objectives:

CO1: Understand basic concepts of Software Quality along with its documents and process
CO2 Apply knowledge of Software Quality in various types of software
CO3: Compare the various reliability models for different scenarios
CO4: Illustrate the software Quality Planning and Assurance
CO5: Make use of various testing techniques in software implementation

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Software Quality**: Definition, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.	**08**
II	**Software Quality Metrics Product Quality Metrics**: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.	**08**
III	**Software Quality Management and Models**: Modeling Process, Software **Reliability Models**: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.	**08**
IV	**Software Quality Assurance**: Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.	**08**
V	**Software Verification, Validation & Testing:** Verification and Validation,	**08**

	Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.	

Text Book:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley-Interscience, 2005; ISBN 0-471- 71345 -7
2. Metrics and Models in Software Quality Engineering, Stephen H. Kan, AddisonWesley (2002), ISBN:0201729156

Reference Book:

1. Norman E. Fenton and Shari Lawrence P fleeger, "Software Metrics" Thomson,2003
2. Mordechai Ben – Menachem and Garry S. Marliss, "Software Quality", Thomson Asia Pte Ltd, 2003.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations/Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Outline software testing and software quality assurance principles.
CO2: Prepare test case and test suites for completely testing all aspects of a system under test.
CO3: Compile findings of a quality assurance cycle.
CO4: Illustrate the software Quality Planning and Assurance
CO5: Make use of various testing techniques in software implementation

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:4Cr	**Subject:** Block chain Architecture
Course Code: MCA-041	**Title:** Block chain Architecture

Course Objectives:

CO1: Study and understand basic concepts of blockchain architecture.
CO2 Analyze various requirements for consensus protocols.
CO3: Apply and evaluate the consensus process.
CO4: Understand the concepts of Hyperledger fabric.
CO5: Analyze and evaluate various use cases in financial software and supply chain.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Blockchain:** Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. **Blockchain Architecture and Design:** Basic crypto primitives: Hash, Signature, Hashchain to Blockchain, Bitcoin Basic, Basic consensus mechanisms.	**08**
II	**Consensus:** Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols, distributed consensus, consensus in Bitcoin. **Permissioned Blockchains:** Design goals, Consensus protocols for Permissioned Blockchains	**08**
III	**Hyperledger Fabric:** Decomposing the consensus process, Hyperledger fabric components. **Chaincode Design and Implementation Hyperledger Fabric:** Beyond Chaincode: fabric SDK and Front End, Hyperledger composer tool.	**08**
IV	**Use case 1:** Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv)Insurance. **Use case 2:** Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc.	**08**
V	**Use case 3:** Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems, Blockchain Cryptography, Privacy and Security on Blockchain	**08**

Text Book:

1. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”,O’Reilly
2. Melanie Swa, “Blockchain”,O’ Reilly

Reference Book:

1. “Hyperledger Fabric”,https://www.hyperledger.org/projects/fabric
2. Bob Dill, David Smits, “Zero to Blockchain - An IBM Redbooks course”, https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Describe the basic concepts and technology used for block chain.
CO2: Describe the primitives of the distributed computing and cryptography related to block chain.
CO3: Illustrate the concepts of Bitcoin and their usage.
CO4: Implement Ethereum block chain contract.
CO5: Apply security features in block chain technologies.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:4Cr	**Subject:** Blockchain Architecture
Course Code: MCA-041	**Title:** Blockchain Architecture

Course Objectives:

CO1: Study and understand basic concepts of blockchain architecture.
CO2 Analyze various requirements for consensus protocols.
CO3: Apply and evaluate the consensus process.
CO4: Understand the concepts of Hyperledger fabric.
CO5: Analyze and evaluate various use cases in financial software and supply chain.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:4
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction to Blockchain:** Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. **Blockchain Architecture and Design:** Basic crypto primitives: Hash, Signature, Hashchain to Blockchain, Bitcoin Basic, Basic consensus mechanisms.	**08**
II	**Consensus:** Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Blockchain consensus protocols, distributed consensus, consensus in Bitcoin. **Permissioned Blockchains:** Design goals, Consensus protocols for Permissioned Blockchains	**08**
III	**Hyperledger Fabric:** Decomposing the consensus process, Hyperledger fabric components. **Chaincode Design and Implementation Hyperledger Fabric:** Beyond Chaincode: fabric SDK and Front End, Hyperledger composer tool.	**08**
IV	**Use case 1:** Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets, (iv)Insurance. **Use case 2:** Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc.	**08**
V	**Use case 3:** Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems, Blockchain Cryptography, Privacy and Security on Blockchain	**08**

Text Book:

1. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”,O’Reilly
2. Melanie Swa, “Blockchain”,O’ Reilly

Reference Book:

1. “Hyperledger Fabric”,https://www.hyperledger.org/projects/fabric
2. Bob Dill, David Smits, “Zero to Blockchain - An IBM Redbooks course”, https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Describe the basic concepts and technology used for block chain.
CO2: Describe the primitives of the distributed computing and cryptography related to block chain.
CO3: Illustrate the concepts of Bitcoin and their usage.
CO4: Implement Ethereum block chain contract.
CO5: Apply security features in block chain technologies.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:**MCA	**Year: II** **Semester:**IV
Credits Theory:3Cr	**Subject:**Internet of Things
Course Code: MCA-043	**Title:**Internet of Things

Course Objectives:

CO1: Demonstrate basic concepts, principles and challenges in IoT.
CO2 Illustrate functioning of hardware devices and sensors used for IoT.
CO3: Analyze network communication aspects and protocols used in IoT.
CO4: Apply IoT for developing real life applications using Ardunio programming.
CO5: To develop IoT infrastructure for popular applications

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Internet of Things (IoT):** Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability	**08**
II	**Hardware for IoT:** Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, Net Arduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	**08**
III	**Network & Communication aspects in IoT:** Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	**08**
IV	**Programming the Ardunio:** Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT.	**08**
V	**Challenges in IoT Design challenges:** Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	**08**

Text Book:

1. Olivier Hersent, David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", willey
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" byPearson

Reference Book:

1. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
2. ArshdeepBahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications,2014
3. Adrian McEwen,HakinCassimally "Designing the Internet of Things" WileyIndia

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/SessionalExamination	20
2. Presentations /Seminar	
3. Assignments	
4. ResearchProjectReport	10
5. SeminarOnResearchProjectReport	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

CourseLearningOutcomes:

CO1: Able to understand the application areas of IOT
CO2: Able to realize the revolution of Internet in Mobile Devices, Cloud &SensorNetworks
CO3: Able to understand building blocks of Internet of Things and characteristics.
CO4: Apply IoT for developing real life applications using Ardunio programming.
CO5: To develop IoT infrastructure for popular applications

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:**MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:**Modern Application Development
Course Code: MCA-044	**Title:** Modern Application Development

Course Objectives:

CO1: Understand the fundamental of Kotlin Programing for Android Application Development.
CO2 Describe the UI Layout and architecture of Android Operating System.
CO3: Designing android application using Jetpack Library based on MVVM Architecture.
CO4: Developing android application based on REST API using Volley and Retrofit Library.
CO5: Ability to debug the Performance and Security of Android Applications.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Kotlin Fundamental:** Introduction to Kotlin, Basic Syntax, Idioms, Coding Conventions, Basics, Basic Types, Packages, Control Flow, Returns and Jumps, Classes and Objects, Classes and Inheritance, Properties and Fields, Interfaces, Visibility Modifiers, Extensions, Data Classes, Generics, Nested Classes, Enum Classes, Objects, Delegation, Delegated Properties, Functions and Lambdas, Functions, Lambdas, Inline Functions, Higher-Order Functions, Scope Functions, Collections, Ranges, Type Checks and Casts, This expressions, Equality, Operator overloading, Null Safety, Exceptions, Annotations, Reflection.	**08**
II	**Android Fundamental: Android Architecture**: Introduction to Android, Layouts, Views and Resources, Activities and Intents, Activity Lifecycle and Saving State, Implicit or Explicit Intents. **User Interaction and Intuitive Navigation:** Material Design, Theme, Style and Attributes, Input Controls, Menus, Widgets, Screen Navigation, Recycler View, ListView, Adapters, Drawables, Notifications.	**08**
III	**Storing, Sharing and Retrieving Data in Android Applications:** Overview to storing data, shared preferences, App settings, Store and query data in Android's SQLite database, Content Providers, Content Resolver, Loading data using loaders. **Jetpack Components :**Fragments, Jetpack Navigation, Lifecycle, Lifecycle Observer, Lifecycle Owner, View Model, View Model Factory, View Model Provider, LiveData, Room API, Data Binding, View Binding, MVVM Architecture Basics	**08**

IV	**Asynchronous Data Handling, Networking and Files:** Asynchronous Task, Coroutines, API Handling, JSON Parsing, Volley Library, Retrofit Library, File Handling, HTML and XML Parsing, Broadcast receivers, Services	**08**
V	**Permissions, Performance and Security:** Firebase, AdMob, APK Singing, Publish App, Packaging and deployment, Google Maps, GPS and Wi-Fi, Download Manager, Work Manager, Alarms, Location, Map and Sensors, APK Singing, Publish App	**08**

Text Book:

1. Meier R.,"Professionai Android 2 Application Development", Wiley.
2. Hashimi S., Komatineni S. And MacLean D., "Pro Android 2", Apress.
3. Murphy M., "Beginning Android 2", Apress.

Reference Book:

1. Delessio C. and Darcey L., "Android Application Development", Pearson Education.
2. DiMarzio J.F., "Android a Programming Guide", Tata McGrawHill.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Describe principles, techniques and usage of modern software development process.
CO2: Solve problems related to real world application development.
CO3: Use standard practices to develop modern application.
CO4: Implement recent devices to develop application.
CO5: Evaluate modern trends of software development

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester:**IV
Credits Theory:3Cr	**Subject:** Distributed Database Systems
Course Code: MCA-045	**Title:** Distributed Database Systems

Course Objectives:

CO1: Understand theoretical and practical aspects of distributed database systems.
CO2 Study and identify various issues related to the development of distributed database system
CO3: Understand the design aspects of object-oriented database system and related development
CO4: Equip students with principles and knowledge of distributed reliability.
CO5: Equip students with principles and knowledge of parallel and object-oriented databases.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction:** Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas. Distributed DBMS Architecture: Architectural Models for Distributed DBMS, DDMBS Architecture. Distributed Database Design: Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.	**08**
II	**Query processing and decomposition:** Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data. Distributed query Optimization: Query optimization, centralized query optimization, distributed query optimization algorithms.	**08**
III	Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: Serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.	**08**
IV	**Distributed DBMS Reliability:** Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. Parallel Database Systems: Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.	**08**
V	**Distributed object Database Management Systems:** Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.	**08**

	Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS	

Text Book:

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

Reference Book:

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Describe distributed database concept and architecture.
CO2: Compare the type of distributed database systems.
CO3: Display knowledge of the fragmentation in distributed database systems.
CO4: Understand of query processing, data and access control of distributed database systems.
CO5: Describe transaction management in distributed database systems

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:**MCA	**Year: II** **Semester:**IV
Credits Theory:3Cr	**Subject:** Mobile Computing
Course Code: MCA-051	**Title:** Mobile Computing

Course Objectives:

CO1:	Study and aware fundamentals of mobile computing.
CO2	Study and analyze wireless networking protocols, applications and environment.
CO3:	Understand various data management issues in mobile computing.
CO4:	Analyze different environment type of security issues in mobile computing
CO5:	Study, analyze, and evaluate various routing protocols used in mobile computing.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	Introduction, Issues in mobile computing, Overview of wireless telephony, Cellular concept, GSM- air interface, channel structure; Location management- HLR-VLR, hierarchical, handoffs; Channel allocation in cellular systems, CDMA, GPRS, MAC for cellular system.	**08**
II	Wireless Networking, Wireless LAN Overview- MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, Data broadcasting, Mobile IP, WAP- architecture, protocol stack, application environment, applications.	**08**
III	Data management issues in mobile computing, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.	**08**
IV	Mobile Agents computing, Security and fault tolerance, Transaction processing in mobile computing environment.	**08**
V	Adhoc networks, Localization, MAC issues, Routing protocols, Global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Adhoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Adhoc Networks, applications	**08**

Text Book:

1. Schiller J., "Mobile Communications", Pearson
2. Upadhyaya S. and Chaudhury A., "Mobile Computing", Springer
3. Kamal R., "Mobile Computing", Oxford UniversityPress.

Reference Book:

1. Talukder A. K. and Ahmed H., "Mobile Computing Technology, Applications and Service Creation", McGraw Hill Education
2. Garg K., "Mobile Computing Theory and Practice", Pearson.
3. Kumar S., "Wireless and Mobile Communication", New Age International Publishers

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Explain the basics of mobile Computing
CO2: Describe the functionality of Mobile IP and Transport Layer
CO3: Classify different types of mobile telecommunication systems
CO4: Demonstrate the Adhoc networks concepts and its routing protocols
CO5: Make use of mobile operating systems in developing mobile applications

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Computer Graphics and Animation
Course Code: MCA-052	**Title:** Computer Graphics and Animation

Course Objectives:

CO1: Understand the graphics hardware used in field of computer graphics.
CO2 Understand the concept of graphics primitives such as lines and circle based on different algorithms.
CO3: Apply the 2D graphics transformations, composite transformation and Clipping concepts.
CO4: Apply the concepts and techniques used in 3D computer graphics, including viewing transformations, projections, curve and hidden surfaces.
CO5: Perform the concept of multimedia and animation in real life.

Nature of Paper: DSE

Minimum Passing Marks/Credits: 40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Introduction and Line Generation:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**08**
II	**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. **Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against nonrectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.	**08**
III	**Three Dimensional:** 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping. **Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**08**
IV	**Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models–	**08**

	Ambient light, Diffuse reflection, Specular reflection and Phongmodel, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	
V	**Multimedia Systems:** Design Fundamentals, Back ground of Art, Color theory overview, Sketching & illustration, Storyboarding, different tools for animation. **Animation:** Principles of Animations, Elements of animation and their use, Power of Motion, Animation Techniques, Animation File Format, Making animation for Rolling Ball, making animation for a Bouncing Ball, Animation for the web, GIF, Plugins and Players, Animation tools for World Wide Web.	**08**

Text Book:

1. Hearn D. and Baker M. P., "Computer Graphics C Version", Pearson Education
2. Foley, Vandam, Feiner, Hughes, "Computer Graphics principle", Pearson Education.
3. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill

Reference Book:

1. Newman W. M., Sproull R. F., "Principles of Interactive computer Graphics", McGraw Hill.
2. Sinha A. N. and Udai A. D.," Computer Graphics", McGraw Hill.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Understand how to generate line, circle and ellipse also how to create 2D object and various transformation techniques.
CO2: Understand various 3D Transformation techniques using OpenGL.
CO3: Understand multimedia compression techniques and applications. Apply the concepts and
CO4: techniques used in 3D computer graphics, including viewing transformations, projections, curve and hidden surfaces.
CO5: Perform the concept of multimedia and animation in real life.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Natural Language Processing
Course Code: MCA-053	**Title:** Natural Language Processing

Course Objectives:

CO1:	Study and understand basic concepts, background and representations of natural language.
CO2	Analyze various real-world applications of NLP.
CO3:	Apply different parsing techniques in NLP.
CO4:	Understand grammatical concepts and apply them in NLP.
CO5:	Apply various statistical and probabilistic grammar methods to handle and evaluate ambiguity.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. ofLectures Allotted
I	**Introduction to Natural Language Understanding:** The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.	**08**
II	Introduction to semantics and knowledge representation, some applications like machine translation, database interface.	**08**
III	Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.	**08**
IV	**Grammars for Natural Language:** Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.	**08**
V	**Ambiguity Resolution:** Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.	**08**

Text Book:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice Hall, New Delhi.
2. James Allen, "Natural Language Understanding", Pearson Education.
3. D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education.

Reference Book:

1. L. M. Ivansca, S. C. Shapiro, "Natural Language Processing and Language Representation", AAAI Press, 2000.
2. T. Winograd, Language as a Cognitive Process, Addison-Wesley.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Apply the principles and Process of Human Languages such as English and other Indian Languages using computers.
CO2: Realize semantics and pragmatics of English language for text processing
CO3: Create CORPUS linguistics based on digestive approach (Text Corpus method)
CO4: Check a current methods for statistical approaches to machine translation.
CO5: Perform POS tagging for a given natural language and Select a suitable language modeling technique based on the structure of the language.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Machine Learning Techniques
Course Code: MCA-054	**Title:** Machine Learning Techniques

Course Objectives:

CO1: To understand the need for machine learning for various problem solving
CO2 To understand a wide variety of learning algorithms and how to evaluate models generated from data
CO3: To understand the latest trends in machine learning
CO4: To design appropriate machine learning algorithms and apply the algorithms to a real-world problems
CO5: To optimize the models learned and report on the expected accuracy that can be achieved by applying the models

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**INTRODUCTION** – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	**08**
II	**REGRESSION:** Linear Regression and Logistic Regression **BAYESIAN LEARNING -** Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. **SUPPORT VECTOR MACHINE:** Introduction, Types of support vector kernel– (Linear kernel, polynomial kernel, and Gaussian kernel), Hyper plane – (Decision surface), Properties of SVM, and Issues in SVM.	**08**
III	**DECISION TREE LEARNING** - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. **INSTANCE-BASED LEARNING** – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	**08**
IV	**ARTIFICIAL NEURAL NETWORKS** – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks,	**08**

	Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; **DEEP LEARNING** - Introduction, concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc.	
V	**REINFORCEMENT LEARNING**–Introduction to Reinforcement Learning , Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process, Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning, Introduction to Deep Q Learning. **GENETIC ALGORITHMS:** Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications	**08**

Text Book:

1. Tom M. Mitchell,—Machine Learning, McGraw-Hill Education (India) Private Limited,2013.
2. Ethem Alpaydin,—Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press 2004.
3. Stephen Marsland,—Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Reference Book:

1. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
2. M. Gopal, "Applied Machine Learning", McGraw Hill Education

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Learn the basics of learning problems with hypothesis and version spaces
CO2: Understand the features of machine learning to apply on real world problems
CO3: Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyze the various algorithms of supervised and unsupervised
CO4: learning
CO5: Analyze the concept of neural networks for learning linear and non-linear activation functions Learn the concepts in Bayesian analysis from probability models and method.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Quantum Computing
Course Code: MCA-055	**Title:** Quantum Computing

Course Objectives:

CO1: Distinguish problems of different computational complexity and explain why certain problems are rendered tractable by quantum computation with reference to the relevant concepts in quantum theory.

CO2 Demonstrate an understanding of a quantum computing algorithm by simulating it on aclassical computer, and state some of the practical challenges in building a quantum

CO3: computer.

Contribute to a medium-scale application program as part of a co-operative team, making use

CO4: of appropriate collaborative development tools (such as version control systems).

Produce code and documentation that is comprehensible to a group of different programmers

CO5: and present the theoretical background and results of a project in written and verbal form.

Apply knowledge, skills, and understanding in executing a defined project of research, development, or investigation and in identifying and implementing relevant outcomes.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Fundamental Concepts:** Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.	**08**
II	**Quantum Computation**: Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.	**08**
III	**Quantum Computers:** Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance	**08**
IV	**Quantum Information:** Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum	**08**

	noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.	
V	**Quantum Error Correction:** Introduction, Shor code, Theory of Quantum Error – Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource .	**08**

Text Book:

1. Micheal A. Nielsen. & Issac L. Chiang, "Quantum Computation and Quantum Information", Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , "Quantum Computing - A Gentle Introduction" (Scientific and Engineering Computation) Paperback –Import,3 Oct 2014
3. Computing since Democritus by Scott Aaronson

Reference Book:

1. Computer Science: An Introduction by N. David Mermin
2. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Able to access the quantum computing services provided by IBM, and other quantum computing services Simulators.

CO2: Able to think independently of quantum circuits, algorithm and applications for real-time stochastic problems in QC.

CO3: Trained to design QC circuits and reversible logics for real world problems. Produce code and documentation that is comprehensible to a group of different programmers and present the

CO4: theoretical background and results of a project in written and verbal form.

Apply knowledge, skills, and understanding in executing a defined project of research,

CO5: development, or investigation and in identifying and implementing relevant outcomes.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Machine Learning Techniques
Course Code: MCA-054	**Title:** Machine Learning Techniques

Course Objectives:

CO1: To understand the need for machine learning for various problem solving
CO2 To understand a wide variety of learning algorithms and how to evaluate models generated from data
CO3: To understand the latest trends in machine learning
CO4: To design appropriate machine learning algorithms and apply the algorithms to a real-world problems
CO5: To optimize the models learned and report on the expected accuracy that canbe achieved by applying the models

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**INTRODUCTION** – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	**08**
II	**REGRESSION:** Linear Regression and Logistic Regression **BAYESIAN LEARNING -** Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. **SUPPORT VECTOR MACHINE:** Introduction, Types of support vector kernel– (Linear kernel, polynomial kernel, and Gaussian kernel), Hyper plane – (Decision surface), Properties of SVM, and Issues in SVM.	**08**
III	**DECISION TREE LEARNING** - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. **INSTANCE-BASED LEARNING** – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	**08**
IV	**ARTIFICIAL NEURAL NETWORKS** – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks,	**08**

	Derivation of Backpropagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; **DEEP LEARNING** - Introduction, concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker, Self-deriving car etc.	
V	**REINFORCEMENT LEARNING**–Introduction to Reinforcement Learning , Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process, Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning, Introduction to Deep Q Learning. **GENETIC ALGORITHMS:** Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications	**08**

Text Book:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press2004.
3. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Reference Book:

1. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
2. M. Gopal, "Applied Machine Learning", McGraw Hill Education

Evaluation/Assessment Methodology

	Max. Marks 100
1. Class tasks/Sessional Examination	20
2. Presentations /Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Learn the basics of learning problems with hypothesis and version spaces
CO2: Understand the features of machine learning to apply on real world problems
CO3: Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyze the various algorithms of supervised and unsupervised learning
CO4: Analyze the concept of neural networks for learning linear and non-linear activation functions
CO5: Learn the concepts in Bayesian analysis from probability models and method.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:** MCA	**Year: II** **Semester: IV**
Credits Theory:3Cr	**Subject:** Machine Learning Techniques
Course Code: MCA-054	**Title:** Machine Learning Techniques

Course Objectives:

CO1: To understand the need for machine learning for various problem solving
CO2 To understand a wide variety of learning algorithms and how to evaluate models generated from data
CO3: To understand the latest trends in machine learning
CO4: To design appropriate machine learning algorithms and apply the algorithms to a real-world problems
CO5: To optimize the models learned and report on the expected accuracy that can be achieved by applying the models

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**INTRODUCTION** – Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	**08**
II	**REGRESSION:** Linear Regression and Logistic Regression **BAYESIAN LEARNING -** Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. **SUPPORT VECTOR MACHINE:** Introduction, Types of support vector kernel– (Linear kernel, polynomial kernel, and Gaussian kernel), Hyper plane – (Decision surface), Properties of SVM, and Issues in SVM.	**08**
III	**DECISION TREE LEARNING** - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. **INSTANCE-BASED LEARNING** – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	**08**
IV	**ARTIFICIAL NEURAL NETWORKS** – Perceptron's, Multilayer perceptron, Gradient descent and the Delta rule, Multilayer networks,	**08**

	Derivation of Back propagation Algorithm, Generalization, Unsupervised Learning – SOM Algorithm and its variant; **DEEP LEARNING** - Introduction, concept of convolutional neural network , Types of layers – (Convolutional Layers , Activation function , pooling , fully connected) , Concept of Convolution (1D and 2D) layers, Training of network, Case study of CNN for eg on Diabetic Retinopathy, Building a smart speaker,Self-deriving car etc.	
V	**REINFORCEMENT LEARNING**–Introduction to Reinforcement Learning , Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process, Q Learning - Q Learning function, Q Learning Algorithm), Application of Reinforcement Learning, Introduction to Deep Q Learning. **GENETIC ALGORITHMS:** Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications	**08**

Text Book:

1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited,2013.
2. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press2004.
3. Stephen Marsl and, ―Machine Learning: An Algorithmic Perspective, CRC Press,2009.

Reference Book:

1. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
2. M. Gopal, "Applied Machine Learning", McGraw Hill Education

Evaluation/Assessment Methodology

	Max. Marks 100
1) Classtasks/Sessiona Examination	20
2) Presentations /Seminar	
3) Assignments	
4) Research Project Report	10
5) Seminar On Research Project Report	
6) ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Learn the basics of learning problems with hypothesis and version spaces
CO2: Understand the features of machine learning to apply on real world problems
CO3: Characterize the machine learning algorithms as supervised learning and unsupervised learning and Apply and analyze the various algorithms of supervised and unsupervised
CO4: learning
CO5: Analyze the concept of neural networks for learning linear and non-linear activation functions Learn the concepts in Bayesian analysis from probability models and method.

Format-3

IIMT UNIVERSITY
Year-II/Semester-IV

Programme: Degree **Class:**MCA	**Year: II** **Semester:**IV
Credits Theory:3Cr	**Subject:** Quantum Computing
Course Code: MCA-055	**Title:** Quantum Computing

Course Objectives:

CO1: Distinguish problems of different computational complexity and explain why certain problems are rendered tractable by quantum computation with reference to the relevant concepts in quantum theory.

CO2 Demonstrate an understanding of a quantum computing algorithm by simulating it on a classical computer, and state some of the practical challenges in building a quantum computer.

CO3: Contribute to a medium-scale application program as part of a co-operative team, making use of appropriate collaborative development tools (such as version control systems).

CO4: Produce code and documentation that is comprehensible to a group of different programmers and present the theoretical background and results of a project in written and verbal form.

CO5: Apply knowledge, skills, and understanding in executing a defined project of research, development, or investigation and in identifying and implementing relevant outcomes.

Nature of Paper: DSE

Minimum Passing Marks/Credits:40% Marks (ISE+ESE)

L:3
T:0
P:0(In Hours/Week)
Theory-1Hr.=1Credit
Practical-2Hrs.=1Credit(4Hrs./Week=4Credits)

Unit	Contents	No. of Lectures Allotted
I	**Fundamental Concepts:** Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.	**08**
II	**Quantum Computation**: Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.	**08**
III	**Quantum Computers:** Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance	**08**
IV	**Quantum Information:** Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations,	**08**

	Limitations of the Quantum operations formalism, Distance Measures for Quantum information.	
V	**Quantum Error Correction:** Introduction, Shor code, Theory of Quantum Error – Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource .	**08**

Text Book:

1. Micheal A. Nielsen. &Issac L. Chiang, "Quantum Computation and Quantum Information", Cambridge University Press, Fint South Asian edition,2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , "Quantum Computing - A Gentle Introduction" (Scientific and Engineering Computation) Paperback –Import,3 Oct 2014
3. Computing since Democritus by Scott Aaronson

Reference Book: Computer Science: An Introduction by N. David Mermin

1. Yan of sky's and Mannucci, Quantum Computing for Computer Scientists.

Evaluation/Assessment Methodology

	Max. Marks 100
1. Classtasks/Sessional Examination	20
2. Presentations/Seminar	
3. Assignments	
4. Research Project Report	10
5. Seminar On Research Project Report	
6. ESE	70
Total:	100

Prerequisites for the course: NIL

Course Learning Outcomes:

CO1: Able to access the quantum computing services provided by BM, and other quantum computing services Simulators.

CO2: Able to think independently of quantum circuits, algorithm and applications for real-time stochastic problems in QC.

CO3: Trained to design QC circuits and reversible logics for real world problems.Produce code and documentation that is comprehensible to a group of different programmers and present the

CO4: theoretical background and results of a project in written and verbal form.

Apply knowledge, skills, and understanding in executing a defined project of research,

CO5: development, or investigation and in identifying and implementing relevant outcomes.