

# NOIDA INTERNATIONAL UNIVERSITY

## DEPARTMENT OF COMPUTER SCIENCE

### SYLLABUS OF COURSES TO BE OFFERED

#### MASTER OF COMPUTER APPLICATIONS UNDER CBCS



**(Academic Session: 2021-22)**

**NOIDA INTERNATIONAL UNIVERSITY**  
**MASTER OF COMPUTER APPLICATIONS**  
**DEGREE COURSE UNDER CBCS**  
The Course of Study and the Scheme of Examinations

**Profile**

- The mission is to apply the knowledge of mathematics and computing fundamentals to various real life applications for any given requirement to prepare an employable professional for the IT field.
- Experienced faculty members with good capabilities.
- Faculty members with ample Industry experience and profound caliber.
- State-of-the-art teaching resources, and well equipped labs, library etc.
- Students' seminar to increase the presentation, skills and their leadership qualities.
- Effective Industry Institute interaction is achieved through seminars, workshops and guest lectures. This encourages the professional discussion between the students and the participating managers from the industry. This also gives the students a chance to envisage their roles in the industry beforehand.
- Enhancing the knowledge of the students by interacting with the Industry skills, and their leadership qualities.

**Program Offered:** Post Graduate

- M.C.A: Masters of computer applications - 2 Years

**PEOs of M.C.A Programme**

M.C.A program of Noida International University will prepare its students for:

- PEO1: Involve in perennial learning for a continued career development and progress as a computer professional
- PEO 2: Communicate effectively and present technical information in oral and written reports
- PEO3: Create and design innovative methodologies to solve complex problems for the betterment of the society and Understand professional, ethical, security and social issues, work with appropriate societal and environmental considerations
- PEO4: To utilize technical knowledge of students towards problem solving using technical skills.

**PSOs of M.C.A Programme**

- PSO1: To create and design innovative methodologies to solve complex computational problems.
- PSO2: To prepare computer applications professionals for the booming information technology industry.
- PSO3: To integrate and apply efficiently the contemporary IT tools.

## **PROGRAM OUTCOMES (POs) - MCA**

### **After completion of program, the students are able to**

- PO1: Computational Knowledge - apply knowledge of computing, mathematics, principals of accounting, management and fundamental of software engineering appropriate to the discipline.
- PO2: Problem Analysis – Identify and analyze problems and formulate the requirements appropriate to its solution.
- PO3: Design Development of Solutions – Design, implements and evaluates a computer-based system to meet the desired needs.
- PO4: Conduct Investigations of Complex Computing Problems – Conduct investigations and experiments to analyze and interpret data of complex applications to find valid solutions.
- PO5: Modern Tool Usage – Select and apply current trends, techniques and modern tools that suit the computing requirements like UML diagrams.
- PO6: Lifelong learning - Build up the passion for continuing professional development.
- PO7: Project Management and Finance - Incorporate scientific, financial and management principles for the development of feasible projects.
- PO8: Communication Efficacy - Communicate effectively across multidisciplinary teams to accomplish a common goal.
- PO9: Societal and Environmental concern - Develop systems that meets the desired solutions .

**NOIDA INTERNATIONAL UNIVERSITY**  
**SCHOOL OF SCIENCES**  
**Study & Evaluation Scheme for Masters of Computer Applications**

**Effective from the Session: 2021-2022**  
**Masters of Computer Applications 1<sup>st</sup> Year**

**SEMESTER- I**

S. No	Course Code	Subject	Period			Evaluation Scheme			Subject Total	Credit	
			L	T	P	CA	TA	Total			External Exam
1	MCA-101	Problem Solving With C++	3	1	0	20	20	40	60	100	4
2	MCA-102	Data Mining & Data Warehousing	3	1	0	20	20	40	60	100	4
3	MCA-103	Adv. Computer Organization & Architecture	3	1	0	20	20	40	60	100	4
4	MCA-104X	DSE-1 Choose any one 1. Cloud Computing Tools & techniques 2. Operation Research 3. Digital Image Processing 4. Data Compression	4	1	0	20	20	40	60	100	5
5	MCA-105X	DSE-2 (Choose any one) 1. Discrete Mathematics Structure 2. Machine Learning 3. Cyber Law & Cyber Security 4. Advanced Industrial Communication	4	1	0	20	20	40	60	100	5
<b>Practical</b>											
1	MCA-151	Problem Solving With C++ Lab	0	0	2	20	20	40	60	100	2
<b>Total</b>										<b>600</b>	<b>24</b>

## Masters of Computer Applications 1<sup>st</sup> Year

### SEMESTER-II

S. No	Course Code	Subject	Period			Evaluation Scheme			Subject Total	Credit	
			L	T	P	CA	TA	Total			External Exam
			1	MCA-201	Adv. Java Programming	3	1	0			20
2	MCA-202	Adv. Data Structure	3	1	0	20	20	40	60	100	4
3	MCA-203	Neural Networks	3	1	0	20	20	40	60	100	4
4	MCA-204X	DSE-3 (Choose any one) 1. Big Data Analytics 2. Hypertext Pre-Processor 3. Web Technologies 4. Distributed Systems	3	1	0	20	20	40	60	100	4
5	MCA-205X	DSE-4 (Choose any one) 1. Software Engineering 2. Microprocessor & Assembly Language 3. Cyber Law & Cyber Security 4. Information Security	4	1	0	20	20	40	60	100	5
<b>Practical</b>											
1	MCA-251	Adv. Java Programming lab	0	0	2			40	60	100	2
2	MCA-255X	DSE-3 Lab	0	0	2			40	60	100	1
<b>Total</b>										<b>700</b>	<b>24</b>

**\*Industrial Seminar is based on Internship/Industrial Training from any industry after 1<sup>st</sup> year summer break.**

**Masters of Computer Applications 2<sup>nd</sup> Year  
SEMESTER-III**

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
			L	T	P	CA	TA	Total	External Exam		
			1	MCA-301	Machine Learning using Python	3	1	0	20		
2	MCA-302	Adv. Dot (.) NET Framework	3	1	0	20	20	40	60	100	4
3	MCA-303	Theory of Computation	3	1	0	20	20	40	60	100	4
<b>Practical</b>											
1	MCA-351	Machine Learning using Python Lab	0	0	2	20	20	40	60	100	2
2	MCA-352	Adv. Dot (.) NET Framework Lab	0	0	2	20	20	40	60	100	2
3	MCA-353	Industrial Seminar	0	0	2	50	50	100	00	100	2
4	MCA-354	Minor Project	0	0	8	20	20	40	60	100	4
<b>Total</b>										<b>700</b>	<b>22</b>

\*Industrial Seminar is based on Internship/Industrial Training from any industry after 1<sup>st</sup> year summer break.

**SEMESTER-IV**

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
			L	T	P	CA	TA	Total	External Exam		
			1	MCA-401	Advanced DBMS	3	1	0	20		
2	MCA-402	Full stack technologies	3	1	0	20	20	40	60	100	4
3	MCA-403	Entrepreneurship Development	3	1	0	20	20	40	60	100	4
<b>Practical</b>											
1	MCA-451	Advanced DBMS Lab	0	0	2	20	20	40	60	100	2
2	MCA-452	Full stack technologies Lab	0	0	2	20	20	40	60	100	2
3	MCA-354	Major Project	0	0	2	50	50	100	100	200	6
<b>Total</b>										<b>700</b>	<b>22</b>

# SEMESTER 1

**Course Code:** MCA101  
**Course Credit Hour:** 4hr

**Course Name:** Problem solving with C++  
**Total Contact Hour:** 60hr

## **Course Objective:**

Giving the student an initial base in the C++ development world, with an emphasis on learning basic programming principles, ranging from I/O operations, variable management, using flow control capabilities and implementation of OOP principles such as classes and inheritance as well as more advanced capabilities such as working with files and network basic operations utilizing the TCP and UDP protocols.

## **Course outcome:**

- The students will be able to choose appropriate data structure for solving problems considering resource constraints such as time and space.

## **Course Description:**

- Design correct programs to solve problems.
- Choose efficient data structures and apply them to solve problems.
- Analyze the efficiency of programs based on time complexity.
- Prove the correctness of a program using loop invariants, pre-conditions and post-conditions in programs

## **Course Contents:**

- **Unit – I:** Definition, types of data structures Flow Control If Statements and, Or Switch Loops – While, Do, For  
**Arrays:** Representation of single and multidimensional arrays; sparse arrays - lower and upper triangular matrices and Tri-diagonal matrices.
- **Unit – II:** Working with pointers □ Memory management □ Arrays □ Strings □ Handling Exceptions  
Basic debugging skills
- UNIT–III:** Object Oriented Programming What is an object o Classes Functions (Access control)
- UNIT–IV:** Object Oriented Programming □ Abstract □ Interface □ Polymorphism
- **UNIT-V: File structure:** physical storage devices and their characteristics, constituents of a file viz. fields, records, fixed and variable length records, primary and secondary keys; file operations, basic file system operations, file organizations: serial sequential, index sequential, direct, inverted, hashing function and collision handling methods.

## **Course learning outcome:**

- **CLO1:** Introduction to Basics of data types and Arrays.
- **CLO2:** This unit is to introduce pointers
- **CLO3:** This unit is to introduce object oriented programming
- **CLO4:** This unit is to introduce to sorting and searching techniques.
- **CLO5:** This unit is to introduce file structures.

**Text books:**

- Data Structures and Algorithm Analysis in C++, by Mark Allen Weiss (Pearson 2007)
- Java-The complete reference,7/e, Herbert schildt, TMH
- JAVA: How to program, 8/e, Dietal , Dietal,PHI
- Introduction of programming with JAVA,S.Dean,TMH
- Introduction to Java programming, 6/e, Y.Daniel Liang, Pearson

**Reference books:**

- Core Java 2, Vol 1(Vol 2) Fundamentals(Advanced), 7/e, Cay.S.Horstmann, Gary Cornell, Pearson
- Big Java2,3/e, Cay.S. Horstmann, Wiley
- Object Oriented Programming through Java, P.Radha Krishna, University Press
- JAVA& Object Orientation an Introduction, 2/e, John Hunt, Springer
- Introduction to JAVA Programming, 7/e, Y. Daniel Liang, Pearson. , TMH

**Online links for study & reference materials :**

<https://slideplayer.com/slide/5987087/>



**Course Code :** MCA102  
**Course Credit Hour :** 4hr

**Course Name :** Data Mining and Warehousing  
**Total Contact Hour :** 60hr

**Course Objective :**

- This course gives an introduction to methods and theory for development of data warehouses and data analysis using data mining. Data quality and methods and techniques for preprocessing of data. Modeling and design of data warehouses. Algorithms for classification, clustering and association rule analysis.

**Course outcome :**

- Understand theoretical and practical aspects of information and data mining
- Understand the quantitative evaluation methods for the IR systems and data mining techniques

**Course Description :**

- Data preprocessing and data quality.
- Modeling and design of data warehouses.
- Algorithms for data mining.

**Course Contents :**

**UNIT-1: Introduction to Data mining,** types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization, OLAP and multi-dimensional data analysis.

**UNIT-II: Classification:** Basic Concepts, Decision Trees and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Nearest Neighborhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case.

**UNIT-III: Association Analysis:** Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms. Handling Categorical, Continuous attributes, Concept hierarchy, Sequential, Sub graph patterns

**UNIT-IV: Clustering:** Over view, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm

**UNIT-V: Web data mining:** Introduction, Web terminology and characteristics, Web content mining, Web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of WebPages, Enterprise search

**Course learning outcome:**

**CLO1 :** to have an Overview and Definition of Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse

**CLO2: :** Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Decision Tree.

**CLO3:** To familiar with principles 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, , Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata

**CLO4 :**To familiar with Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases

**CLO5:** To familiar with Data Visualization and Overall Perspective: Aggregation, Historical 8 information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery

**Text books :**

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

**Online links for study & reference materials :**

<https://www.dei.unipd.it/~capri/SI/MATERIALE/DWDM0405.pdf>

**Course Code:** MCA103  
**Course Credit Hour:** 4hr

**Course Name:** Advance Computer organization and architecture  
**Total Contact Hour:** 60hr

**Course Objective:**

- To facilitate the students, learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design.
- To facilitate the students to be familiarized with the hardware components and concepts related to the input-output organization.
- To facilitate the students to be familiarized with the hardware components and concepts related to the memory organization.
- To facilitate the students to be familiarized with the concepts related to the 8086-micro controller like pin diagram, different types of registers and addressing modes.

**Course Outcome:**

- The students will be capable of using the methods to study of physical memory and various machine language codes.
- The students will get an overall view of computer architecture

**Course Description:**

- Computer architecture is a specification detailing how a set of software and hardware technology standards interact to form a computer system or platform. Computer architecture refers to how a computer system is designed and what technologies it is compatible with. There are three categories of computer architecture:
- System Design: This includes all hardware components in the system, including data processors aside from the CPU, such as the graphics processing unit and direct memory access. It also includes memory controllers, data paths and miscellaneous things like multiprocessing and virtualization
- Instruction Set Architecture (ISA): This is the embedded programming language of the central processing unit. It defines the CPU's functions and capabilities based on what programming it can perform or process. This includes the word size, processor register types, memory addressing modes, data formats and the instruction set that programmers use.
- Micro architecture: Otherwise known as computer organization, this type of architecture defines the data paths, data processing and storage elements, as well as how they should be implemented

**Course Contents:**

- **Unit-I:** Basis Computer Architecture, Functional Organization, Register Organization, Arithmetic and Logic Unit, Central Processing unit, Instruction Formats. CPU architecture, instruction format, addressing mode, stacks and handling of interrupts. Assembly language - Elementary problems
- **Unit-II:** Addressing Modes. Data Transfer and Manipulation, interrupts RISC/CISC architecture. Register transfer and macro-operations, Register Transfer Languages (RTL). Arithmetic, Logic and Shift Macro-operations, Sequencing, Micro-program sequences.
- **Unit-III:** Memory & Storage: Processor Vs. Memory speed: Cache memory. Associative memory, Virtual memory and Memory management. Pipeline & vector processing
- **Unit-IV:** Input/ Output organization: Peripheral devices, I/O Asynchronous Data Transfer: Strobe Control, Data Transfer Schemes (Programmed, Initiated, DW, Transfer)

- **Unit-V: Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory**

**Course learning Outcome:**

- **CO1.** This unit is for understanding function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer.
- **CO2.** Machine instructions, Operands, addressing modes, Instruction formats, Instruction sets, Instruction set architectures - CISC and RISC architectures.
- **CO3.** Organization of a processor - Registers, ALU and Control unit, Data path in a CPU, Instruction cycle, Organization of a control unit - Operations of a control unit, Hardwired control unit, Microprogrammed control unit
- **CO4.** Semiconductor memories, Memory cells - SRAM and DRAM cells, Internal Organization of a memory chip, Organization of a memory unit, Error correction memories, Interleaved memories, Cache memory unit - Concept of cache memory, Mapping methods, Organization of a cache memory unit, Fetch and write mechanisms, Memory management unit - Concept of virtual memory, Address translation, Hardware support for memory manage.
- **CO5.** Access of I/O devices, I/O ports, I/O control mechanisms - Program controlled I/O Interrupt controlled I/O and DMA controlled I/O I/O interfaces Program controlled I/O, Interrupt controlled I/O, and DMA controlled I/O, I/O interfaces - Serial port, Parallel port, PCI bus, SCSI bus, USB bus, Firewall and Infini Band, I/O peripherals - Input devices, Output devices, Secondary storage devices.

**Text books :**

- Moris Mano, “Computer System Architecture”, PHI Publications, 2002
- R. P. Jain, “Modern Digital Electronics”, TMH, 3rd Edition, 2003

**Reference Books:**

- Computer System Architecture (Third Edition),. Morris Mono - Pearson Prentice Hall,2007.

**Online links for study & reference materials :**

- [http://www.cse.iitm.ac.in/~vplab/courses/comp\\_org/LEC\\_INTRO.pdf](http://www.cse.iitm.ac.in/~vplab/courses/comp_org/LEC_INTRO.pdf)

**Course Code:** MCA1041  
**Course Credit Hour:** 4hr

**Course Name:** Cloud computing  
**Total Contact Hour:** 60hr

**Course Objective:**

The course is aimed at general introduction to the subject of cloud computing and its relevance to computer science. We start with elements of logic with emphasis on propositional logic and predicate calculus. Next we discuss sets and functions and develop the concepts of floor and ceiling functions and their use in computer science. The important topic of growth of functions and the methods of estimating the order of growth with the big-O, big-Omega, and big-Theta are discussed. After introducing algorithms, we pass on to principle of mathematical induction which is an important tool for proving general results. Counting techniques, relations, graphs and trees are also discussed at some length.

**Course Outcome:**

- The students will be capable of using the mathematical methods and algorithms learned for analyzing and solving problems related to Computer Science.
- The students will get an overall view of concepts in probability and statistics.

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

**Unit 1:** Overview of Cloud Computing Introduction to cloud, features of cloud (benefits and disadvantages), architecture of cloud computing, types of service delivery in cloud ,their providers and examples of software for each type(Iaas, Paas, Saas), cloud deployment models: Public ,private and hybrid cloud.

**Unit 2:** Cloud Computing Concepts: Virtualization: introduction to virtualization, characteristics of virtualization, how is virtualization achieved, what is hypervisor, types of hypervisor (type 1 and type 2),Multitenancy and its advantages and disadvantages, migration in cloud.

**Unit 3:** Distributed systems Introduction to distributed systems, How are distributed systems managed, Introduction to mapreduce framework, importance of mapreduce , understanding how it works with an example. Introduction to Hadoop, What is hadoop, why hadoop ,HDFS ,Traditional file system vs HDFS, Big data: what is big data, features of big data, study sample dataset for big data, techniques and tools for handling big data, Hive

**Unit 4:** Saas What is Saas, Agile programming, Introduction to OOP, Introduction to Ruby, simple programming using Ruby, Ruby on Rails.

**Unit 5:** Cloud security Security risks in cloud, types of threat in cloud, ways of handling the threats, covert channel attacks in cloud, detection mechanisms for the threats, ways of making cloud secure.

**Course Code:** MCA104X2

**Course Credit Hour:** 4hr

**Course Name:** operation research

**Total Contact Hour:** 60hr

**Course Objective:**

The course is aimed at general introduction to the subject of cloud computing and its relevance to computer science. We start with elements of logic with emphasis on propositional logic and predicate calculus. Next we discuss sets and functions and develop the concepts of floor and ceiling functions and their use in computer science. The important topic of growth of functions and the methods of estimating the order of growth with the big-O, big-Omega, and big-Theta are discussed. After introducing algorithms, we pass on to principle of mathematical induction which is an important tool for proving general results. Counting techniques, relations, graphs and trees are also discussed at some length.

**Course Outcome:**

- The students will be capable of using the mathematical methods and algorithms learned for analyzing and solving problems related to Computer Science.
- The students will get an overall view of concepts in probability and statistics.

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

**Unit 1:** Overview of Cloud Computing Introduction to cloud, features of cloud(benefits and disadvantages), architecture of cloud computing, types of service delivery in cloud ,their providers and examples of software for each type(Iaas, Paas, Saas), cloud deployment models: Public ,private and hybrid cloud.

**Unit 2:** Cloud Computing Concepts: Virtualization: introduction to virtualization, characteristics of virtualization, how is virtualization achieved, what is hypervisor, types of hypervisor(type 1 and type 2),Multitenancy and its advantages and disadvantages, migration in cloud.

**Unit 3:** Distributed systems Introduction to distributed systems, How are distributed systems managed, Introduction to mapreduce framework, importance of mapreduce , understanding how it works with an example. Introduction to Hadoop, What is hadoop, why hadoop ,HDFS ,Traditional file system vs HDFS, Big data: what is big data, features of big data, study sample dataset for big data, techniques and tools for handling big data, Hive

**Unit 4:** Saas What is Saas, Agile programming, Introduction to OOP, Introduction to Ruby, simple programming using Ruby, Ruby on Rails.

**Unit 5:** Cloud security Security risks in cloud, types of threat in cloud, ways of handling the threats, covert channel attacks in cloud, detection mechanisms for the threats, ways of making cloud secure.

**Course Code:** MCA104X3

**Course Name:** digital image processing

**Course Credit Hour:** 4hr

**Total Contact Hour:** 60hr

**Course Objective:**

The course is aimed at general introduction to the subject of cloud computing and its relevance to computer science. We start with elements of logic with emphasis on propositional logic and predicate calculus. Next we discuss sets and functions and develop the concepts of floor and ceiling functions and their use in computer science. The important topic of growth of functions and the methods of estimating the order of growth with the big-O, big-Omega, and big-Theta are discussed. After introducing algorithms, we pass on to principle of mathematical induction which is an important tool for proving general results. Counting techniques, relations, graphs and trees are also discussed at some length.

**Course Outcome:**

- The students will be capable of using the mathematical methods and algorithms learned for analyzing and solving problems related to Computer Science.
- The students will get an overall view of concepts in probability and statistics.

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

- **UNIT-I** Introduction and Fundamentals Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.
- **UNIT-II** Image Enhancement in Spatial Domain Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.
- **UNIT-III** Image Restoration A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.
- **UNIT-IV** Morphological Image Processing Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening
- **UNIT-V** Registration Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth Segmentation Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector

### Course learning outcome:

- **CO1.** The students will be able to understand the concept of functions and various relations as well as function mappings performed. The concept of algebraic structures and manipulations using various axioms is performed Introduction to partially ordered sets and conditions necessary for a poset to qualify as a lattice. Lattice homomorphism and practice problems on the same.
- **CO2.** Concept of mathematical logic, arguments and reasoning. Conjunction, disjunction and negation of statements. Wff, the concept of free and bounded variables. Tautology and equivalence relations and proof of contradiction.
- **CO3.** This unit is for introduction to the basics of counting. Permutations and combinations. Principal of inclusion- exclusion and practice for the same.
- **CO4.** Students will be able to have an understanding of various methods of generating coefficient of functions. Recurrence relation by substitution and generating root solution for homogeneous recurrence relation.
- **CO5.** This unit covers the graph representation. Various types of graphs and graph isomorphism, paths circuits and sub graphs. Multi-graphs, Euler circuits Euler paths, Hamiltonian graphs and chromatic representation of graphs.

### Text books:

- 1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education. 2.

### Reference Books:

- Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
- Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River,

### Online links for study & reference materials :

- <https://mls.cs.fiu.edu/fajkkmmnh/16-lonzo-mayert-i-1/BRe4S4kyV-discrete-mathematics-with-graph-theory-9789382127185.pdf>



**Course Code:** MCA1044  
**Course Credit Hour:** 4hr

**Course Name:** Data compression  
**Total Contact Hour:** 60hr

**Course Objective:** The course covers the theory of quantization and basic concepts in source coding and applications of the theory and concepts to systems that convert analog or high-rate digital signals into low-rate digital representations with or without loss of fidelity. The concept of source coding is extended to general descriptions of a statistical information source where various data modeling techniques find useful applications.

**Course Outcome:**

- The students will be capable of using the mathematical methods and algorithms learned for analyzing and solving problems related to Computer Science.
- The students will get an overall view of concepts in probability and statistics.

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

**UNIT I :**Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

**UNIT II:** The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

**UNIT III :** Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markov Compression.

**UNIT IV :**Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

**UNIT V :**Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured Vector Quantizers.

**Course learning outcome:**

- **CO1.** gain a fundamental understanding of data compression methods for text, images, and video, and related issues in the storage, access, and use of large data sets
- **CO2.** illustrate the concept of various algorithms for compressing text, audio, image and video information.

**Text books:**

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression, Drozdek, Cengage Learning

**Online links for study & reference materials :**

<https://mls.cs.fiu.edu/fajkkmnmh/16-lonzo-mayert-i-1/BRe4S4kyV-discrete-mathematics-with-graph-theory-9789382127185.pdf>

**Course Code:** MCA1051  
**Course Credit Hour:** 4hr

**Course Name:** Discrete Mathematics Structure  
**Total Contact Hour:** 60hr

**Course Objective:**

- The course is aimed at general introduction to the subject of discrete mathematics and its relevance to computer science. We start with elements of logic with emphasis on propositional logic and predicate calculus. Next we discuss sets and functions and develop the concepts of floor and ceiling functions and their use in computer science. The important topic of growth of functions and the methods of estimating the order of growth with the big-O, big-Omega, and big-Theta are discussed. After introducing algorithms, we pass on to principle of mathematical induction which is an important tool for proving general results. Counting techniques, relations, graphs and trees are also discussed at some length.

**Course Outcome:**

- The students will be capable of using the mathematical methods and algorithms learned for analyzing and solving problems related to Computer Science.
- The students will get an overall view of concepts in probability and statistics.

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

- **Unit - I: Mathematical Logic:** Statements and notations, Connectives, Well-formed formulas, Truth tables, tautology, equivalence implication, Normal forms, Theory of inference for the statement calculus, Rules of inference, Consistency of premises and indirect method of proof, Automatic Theorem Proving Predicate calculus: Predicates, statement functions, variables and quantifiers, predicate formulas, free & bound variables, universe of discourse, inference theory of predicate calculus
- **Unit - II: Set theory & Relations:** Introduction, Relations and ordering, Properties of binary Relations, Equivalence, Compatibility Relations, Partial ordering, Hasse diagram. **Functions:** composition of functions, Inverse Function, Recursive Functions, Lattice and its Properties, Pigeon-hole Principles and its application. **Algebraic structures:** Algebraic systems, Examples and general properties, Semi groups and monoids, groups, sub groups, Definitions, Examples, homomorphism, Isomorphism and related problems.
- **Unit - III: Elementary Combinatorics:** Basis of counting, Enumeration of Combinations & Permutations, Enumerating of Combinations & Permutations with repetitions and constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, principles of Inclusion – Exclusion.
- **Unit - IV: Recurrence Relations:** Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, Solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.
- **Unit - V: Graph Theory:** Representation of Graph, Spanning Trees, BFS, DFS, Krushkal's Algorithm, Binary trees, Planar Graphs, Graph Theory and Applications, Basic Concepts, Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

### Course learning outcome:

- **CO1.** The students will be able to understand the concept of functions and various relations as well as function mappings performed. The concept of algebraic structures and manipulations using various axioms is performed Introduction to partially ordered sets and conditions necessary for a poset to qualify as a lattice. Lattice homomorphism and practice problems on the same.
- **CO2.** Concept of mathematical logic, arguments and reasoning. Conjunction, disjunction and negation of statements. Wff, the concept of free and bounded variables. Tautology and equivalence relations and proof of contradiction.
- **CO3.** This unit is for introduction to the basics of counting. Permutations and combinations. Principal of inclusion- exclusion and practice for the same.
- **CO4.** Students will be able to have an understanding of various methods of generating coefficient of functions. Recurrence relation by substitution and generating root solution for homogeneous recurrence relation.
- **CO5.** This unit covers the graph representation. Various types of graphs and graph isomorphism, paths circuits and sub graphs. Multi-graphs, Euler circuits Euler paths, Hamiltonian graphs and chromatic representation of graphs.

### Text books:

- Discrete mathematical structures with applications to computer science Trembly J.P. & Manohar. P, TMH
- Discrete mathematics and its applications, Kenneth H. Rosen, 5<sup>th</sup> edition. TMH

### Reference Books:

- Discrete mathematical structures, bernand kolman, roberty C.
- Discrete maths and problems thomas koshey, Elsevier.

### Online links for study & reference materials :

- <https://mathworld.wolfram.com/DiscreteMathematics.html>
- <https://mls.cs.fiu.edu/fajkmnmh/16-lonzo-mayert-i-1/BRe4S4kyV-discrete-mathematics-with-graph-theory-9789382127185.pdf>

**Course Code:** MCA1052  
**Course Credit Hour:** 4hr

**Course Name:** Machine Learning  
**Total Contact Hour:** 60hr

**Course Objective:** Understanding Various Machine Learning Algorithms & Their Area of Applications

**Course Outcome:**

- The students will be capable of using the mathematical methods and algorithms learned for analyzing and solving problems related to Computer Science.
- The students will get an overall view of concepts in machine learning

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

- **Unit - I:** Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system: training data, concept representation, function approximation.  
**Unit - II:** The concept learning task. Concept learning as search through a hypothesis space. General-to-specific ordering of hypotheses. Finding maximally specific hypotheses. Version spaces and the candidate elimination algorithm. Learning conjunctive concepts. The importance of inductive bias.
- **Unit - III:** Representing concepts as decision trees. Recursive induction of decision trees. Picking the best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity. Occam's razor. Overfitting, noisy data, and pruning.
- **Unit - IV:** Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.
- **Unit - V:** Translating decision trees into rules. Heuristic rule induction using separate and conquer and information gain. First-order Horn-clause induction (Inductive Logic Programming) and Foil. Learning recursive rules. Inverse resolution, Golem, and Progol.

**Course learning outcome:**

- **CO1.** Explain the Process of Formulating & Solving Real World Problem using Machine Technology
- **CO-2** Design and Implement various Decision Making Problems using

**Text books:**

- Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das Machine Learning Pearson Education

**Reference Books:** Anuradha Srinivasaraghavan, Vincy Joseph Machine Learning Wiley India

**Online links for study & reference materials :**

- <http://vbtmca.ac.in/SYLLABUS/Sem%203/639402.pdf>

**Course Code:** MCA1053

**Course Name:** cyber law and security

**Course Credit Hour:** 4hr

**Total Contact Hour:** 60hr

**Course Objective:** the increasing number of networked information technologies— including internet of things (IoT), wearables, ubiquitous sensing, social sharing platforms, and other AI-driven systems—are generating a tremendous amount of data about individuals, companies, and societies. These technologies offer enormous benefits but also create enormous risks to individual privacy and national security. Further, the ease with which data can be collected from online sources, analyzed, and inferences drawn about individual users raises a wide range of ethical questions about these technologies, their creators, and their users.

**Course Outcome:**

- Identify and explain basic ethical and policy-based frameworks for working with big data and apply these frameworks to real-world cases.

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

- **Unit - I: What are Ethics?** :Unit 1 of this course establishes a basic foundation in the notion of simple utilitarian ethics we use for this course. The lecture material and the quiz questions are designed to get most people to come to an agreement about right and wrong, using the utilitarian framework taught here. In this module we will talk about the laws that govern the Principle of Informed Consent. We will also discuss why informed consent doesn't work well for retrospective studies, or for the customers of electronic businesses.
- **Unit - II: Data Ownership Privacy** :Who owns data about you? We'll explore that question in this unit. A few examples of personal data include copyrights for biographies; ownership of photos posted online, Yelp, Trip Advisor, public data capture, and data sale. We'll also explore the limits on recording and use of data. We have seen the rise different value systems with regards to privacy. In this unit the relationship between the services we are provided and the data we provide in exchange
- **Unit - III: Data Validity and Algorithmic Fairness** Data validity is not a new concern. All too often, we see the inappropriate use of Data Science methods leading to erroneous conclusions. This module points out common errors, in language suited for a student with limited exposure to statistics. We'll focus on the notion of representative sample: opinionated customers. Only recently have people begun to think about how algorithmic decisions can be unfair.
- **Unit - IV: Societal Consequences and attributions** , This unit is focused on considering societal consequences of Data Science that we should be concerned about even if there are no issues with fairness, validity, anonymity, privacy, ownership or human subjects research. These “systemic” concerns are often the hardest to address, yet just as important as other issues discussed before. This unit also focuses on ossification, or the tendency of algorithmic methods to learn and codify the current state of the world and thereby make it harder to change. Information asymmetry has long been exploited for the advantage of some, to the disadvantage of others. Information technology makes spread of information easier, and hence generally decreases asymmetry. However, Big Data sets and sophisticated analyses increase asymmetry in favor of those with ability to acquire/access.

**Course learning outcome:**

- **CO1.**Identify situations where data is sensitive, assess the risks, and describe how various stakeholders could respond to those risks.
- CO-2** Describe how to minimize privacy/security compromises through the data lifecycle (from collection through dissemination).

**Text books:**

- The code book simon singh tata mcgrawhill

**Online links for study & reference materials :**

- <http://vbtmca.ac.in/SYLLABUS/Sem%203/639402.pdf>

**Course Code:** MCA1054

**Course Credit Hour:** 4hr

**Course Name:** Advance industrial communication

**Total Contact Hour:** 60hr

**Course Objective :**

- To create an understanding in the mind of the student regarding formal and professional communication practised in a professional environment .
- To familiarize students with the concept of entrepreneurship and practices.

**Course outcome :**

- Master the art of a professional business presentation •
- Distinguish different communication process and its practical application
- To understand various functions and outcomes of entrepreneurial activities.

**Course Description:**

- In the present industrial scenario the role of entrepreneurship and communication is becoming more vital day by day specially in case of More advanced, industries where client interaction plays a major role. The concept of entrepreneurship and turning a mere business idea into a full fledged project requires highly skilled approach towards not just communicating but realizing the business. This course will present an opportunity towards the students to learn corporate interactions in a highly competitive corporate world. Along with learning various processes involved in running an enterprise.

**Course Contents:**

Unit-I Communicative Grammar: Spotting the errors pertaining to nouns, pronouns, adjective and adverbs; Concord - grammatical concord, notional concord and the principle of proximity between subject and verb. Changing the voice: from Active to Passive and Passive to Active. Idioms and phrases; Words often confused; One-Word Substitutes; Formation of words (suffixes, prefixes and derivatives);

Unit-II Oral Communication: Introduction to principal components of spoken English – Transcription, Word accent, Intonation, Weak forms in English. Developing listening and speaking skills through various activities, such as (a) role play activities, (b) Practicing short dialogues (c) Group discussion (d) Debates (e) Speeches (f) Listening to news bulletins (g) Viewing and reviewing T.V. programmes etc.

Unit-III Written Communication: Developing reading and writing skills through such tasks/activities as developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures/cartoons.

Unit-IV Book Review – Herein the students will be required to read and submit a review of a book (Literary or non-literary) of their own choice. This will be followed by a presentation of the same in the class. Technical Writing: (a) Business Letters, Format of Business letters and Business letter writing (b) E-mail writing (c) Reports, Types of Reports and Format of Formal Reports (d) Press Report Writing

Unit-V Proper use of Language: The Communication Skills, The effective Speech. Effective self-presentation & facing interview: The interview process & preparing for it, the presentation skills.

**Course learning outcome:**

- **CO1.** Explain the Process of Formulating & Solving Real World Problem using Machine Technology
- **CO-2** Design and Implement various Decision Making Problems using

**Text books:**

- Common Errors in English, Abul Hashem, Ramesh Publishing House, new Delhi.

**Reference Books:**

- **Language in Use (Upper intermediate Level, Adrian Doff Christopher Jones, Cambridge University Press**

**MCA-151- problem solving with C ++**

**Course Code : MCA201**

**Course Credit Hour : 4hr**

**Course Name : Advance JAVA**

**Total Contact Hour : 60hr**

**Course Objective :**

- This course focuses on the advantages of the OO paradigm and domain modeling in reducing the representational gap between a target domain and the software application itself. Minimizing this gap leads to more effective solutions that are both flexible and robust. The modeling notation taught and used in conjunction with the course is the industry standard JAVA
- JAVA provides a programming language independent framework for the analysis, design, programming and testing of software applications. Using a combination of and various techniques for analysis and design.
- the course relates Object Oriented concepts to modeling complex problems. Models built using these techniques have a very high success rate when turned into working code.

#### Course outcome :

- Design the classes needed, given a problem specification.
- Implement the designed classes using the object oriented programming language.
- Learn how to test, verify, and debug object-oriented programs and create programs using object oriented principals

#### Course Description :

- Learn the three pillars of building a system; The Model, The Process, The Best Practices
- Have a good, working definition of object-oriented programming
- Understand the object oriented model, including types, objects, encapsulation, abstraction, messaging, protocols, inheritance, polymorphism, relationships, and coupling, strengths and weaknesses
- Understand the concept of representational gap between an application and its targeted domain
- Relate how Domain Modeling minimizes the representational gap between domain and application

#### Course Contents :

- **UNIT-I: Basics of Object Oriented Programming (OOP):** Need for OO paradigm , A way of viewing world- Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of OOP concepts, coping with complexity, abstraction mechanisms.  
**Java Basics:** Data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects- concepts of classes, objects, constructors methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.
- **UNIT-II: Inheritance:** Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism, abstract classes.  
**Packages and Interfaces:** Defining, Creating and Accessing a package, Understanding CLASSPATH, Importing packages, differences between classes and interfaces, defining an interface, Implementing interface, applying interfaces variables in interface and extending interfaces.
- **UNIT-III: Exception handling and Multithreading:** Concepts of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, usage of try, catch, throws and finally, built in exceptions, creating own exception sub classes.



Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups

- **UNIT-IV: Event Handling:** Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy , user-interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, list panes- scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types- boarder, grid, flow, card and grid bag.
- **UNIT-V: Applets:** Concepts of Applets, differences between applets and applications, lifecycle of an applet, types of applets, creating applets, passing parameters to applets, **Swings:** Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons-The JButton class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables.

#### **Course learning outcome :**

- **CLO1 :** basics of object learning methodology and concepts of class creation and object interaction
- **CLO2:** : Have a basic knowledge of the use of attributes , objects, methods etc.
- **CLO3:** To understand Class Modeling and Design Approaches: Three approaches for identifying classes - using Noun phrases, Abstraction, Use Case Diagram. Comparison of approaches. Using combination of approaches
- **CLO4 :**Techniques for Interaction diagrams: Sequence diagram - Sequence diagram notations and examples,iterations, conditional messaging, branching, object creation and destruction, time constraints, origin of links, Activations in sequence diagram
- **CLO5:** developing dynamic systems: Top - down approach for dynamic systems. Bottom - up approach for dynamic systems. Flexibility Guidelines for Behavioral Design

#### **Text books :**

- 1.Designing Flexible Object Oriented systems with UML - Charles Ritcher
- 2.object Oriented Analysis & Design, Sat/.inger. Jackson, Burd Thomson
- 3.Object oriented Modeling and Design with UML - James Rumbaugh. Micheal Blaha (secondedition)

#### **Reference books :**

- 1.The Unified Modeling Language User Guide - Grady Booch, James Rumbaugh, IvarJacobson.
- 2.Oriented Modeling and Design - James Rumbaugh
- 3.Teach Yourself UML in 24 Hours - Joseph Schmuilers

#### **Online links for study & reference materials :**

[https://www.vssut.ac.in/lecture\\_notes/lecture1423183198.pdf](https://www.vssut.ac.in/lecture_notes/lecture1423183198.pdf)

### Course Objective:

- The objective of the course is to teach programming (with an emphasis on problem solving) and introduce elementary data structures. The student should, at a rudimentary level, be able to prove correctness (loop invariants, conditioning, etc) and analyze efficiency (using the 'O' notation).

### Course outcome:

- The students will be able to choose appropriate data structure for solving problems considering resource constraints such as time and space.

### Course Description:

- Design correct programs to solve problems.
- Choose efficient data structures and apply them to solve problems.
- Analyze the efficiency of programs based on time complexity.
- Prove the correctness of a program using loop invariants, pre-conditions and post-conditions in programs

### Course Contents:

- **Unit – I: Data structure:** Definition, types of data structures Recursion Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function  
**Arrays:** Representation of single and multidimensional arrays; sparse arrays - lower and upper triangular matrices and Tri-diagonal matrices.
- **Unit – II: Stacks and Queues:** Introduction and primitive operations on stack; Stack application, Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion from infix to postfix, Introduction and primitive operation on queues.
- **UNIT–III: Lists:** Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion, searching, Two way lists and Use of headers.  
**Trees:** Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; threaded trees, binary search trees, trees in search algorithm. B- tree. B+ tree and applications.
- **UNIT–IV: Sorting Techniques:** Insertion sort, selection sort, merge sort, heap sort.  
**Searching Techniques:** Linear search, binary search and hashing.
- **UNIT-V: File structure:** physical storage devices and their characteristics, constituents of a file viz. fields, records, fixed and variable length records, primary and secondary keys; file operations, basic file system operations, file organizations: serial sequential, index sequential, direct , inverted, hashing function and collision handling methods.

### Course learning outcome:

- **CLO1:** Introduction to Basics of Data Structure and Arrays.
- **CLO2:** This unit is to introduce to stacks and queues.
- **CLO3:** This unit is to introduce Linked lists and trees.
- **CLO4:** This unit is to introduce to sorting and searching techniques.
- **CLO5:** This unit is to introduce file structures.

**Text books:**

- Data Structures and Algorithm Analysis in C++, by Mark Allen Weiss (Pearson 2007)
- Java-The complete reference,7/e, Herbert schildt, TMH
- JAVA: How to program, 8/e, Dietal , Dietal,PHI
- Introduction of programming with JAVA,S.Dean,TMH
- Introduction to Java programming, 6/e, Y.Daniel Liang, Pearson

**Reference books:**

- Core Java 2, Vol 1(Vol 2) Fundamentals(Advanced), 7/e, Cay.S.Horstmann, Gary Cornell, Pearson
- Big Java2,3/e, Cay.S. Horstmann, Wiley
- Object Oriented Programming through Java, P.Radha Krishna, University Press
- JAVA& Object Orientation an Introduction, 2/e, John Hunt, Springer
- Introduction to JAVA Programming, 7/e, Y. Daniel Liang, Pearson. , TMH

**Online links for study & reference materials :**

<https://slideplayer.com/slide/5987087/>

**Course Objective:**

- Gain a historical perspective of neural networks and its foundations.
- Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool. Experiment with a machine learning model for simulation and analysis.
- Explore the current scope, potential, limitations, and implications of intelligent systems.

**Course outcome:** At the end of the course, student will be able to

- Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents
- Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
- Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing
- Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
- Solve problems with uncertain information using Bayesian approaches.

**Course Contents:**

Unit – I: Introduction to ANN Features , structure and working of Biological Neural Network , Trends in Computing Comparison of BNN and ANN 4 10 2

Unit-II Basics of Artificial Neural Networks - History of neural network research, characteristics of neural networks terminology, models of neuron Mc Culloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture

Unit-III :Backpropagation networks : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.

Unit IV: Activation & Synaptic Dynamics : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks.

Unit V: Basic functional units of ANN for pattern recognition tasks: Basic feed forward, Basic feedback and basic competitive learning neural network.

**Course learning outcome:**

- **CLO1: To organize synaptic connectivity as the basis of neural computation and learning**
- **CLO2: 2. To learn the ideological basics of artificial neural networks**
- **CLO3:To learn the origins of artificial neural networks**
- **CLO4: To know some application of artificial neural networks**

**Text books:**

1. Yegnanarayana - Artificial neural network PHI Publication.

2. S. Raj sekaran, Vijayalakshmi Pari - Neural networks, Fuzzy logic and Genetic Algorithms

**.Reference books:**

- Nelson Morgan – Artificial neural network: Electronic Implementations – IEEE Press, 1990

**Course Code:** MCA2041

**Course Name:** Big Data Analytics

**Course Credit Hour:** 4hr

**Total Contact Hour:** 60hr

**Course Objective:** The main objective of this course is to

- Provide an overview of an exciting growing field of Big Data analytics
- Introduce the tools required to manage and analyze big data like Hadoop, MapReduce etc.

**Course outcome:** At the end of the course, student will be able to

- Understand the programming requirements viz., generic types and methods to perform data analysis
- Understand the existing technologies and the need of distributed files systems to analyze the big data
- To understand and analyze Map-Reduce programming model for better optimization
- Collect, manage, store, query, and analyze big data; and identify the need of interfaces to perform I/O operations in Hadoop
- Identify the need based tools, viz., Pig and Hive and to handle
- Formulate an effective strategy to implement a successful Data analytics project

**Course Contents :**

- UNIT-I: Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization
- UNIT-II: Working with Big Data: Google File System, Hadoop Distributed File System (HDFS), Building blocks of Hadoop (Name node, Data node, Secondary Name node, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.
- UNIT-III: Writing Map Reduce Programs: A Weather Dataset, Understanding Hadoop API for Map Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner
- UNIT-IV: Hadoop I/O: The Writable Interface, Writable Comparable and comparators. Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators
- UNIT-V: Pig: Hadoop Programming Made Easier, Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin,
- Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

**Course learning outcome:** The course learning outcomes are designed to specify what the students will be able to perform after completion of the course:

- Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

- Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
- Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.
- Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.

**Text Books:**

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'Reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ
4. Hadoop for Dummies by Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown and Rafael Coss

**Reference Books:**

1. Hadoop in Practice by Alex Holmes, MANNING Publ
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne

**Web Resources:**

- :<https://hadoop.apache.org/>
- Hive: <https://cwiki.apache.org/confluence/display/Hive/Home/>
- Piglatin: <https://pig.apache.org/docs/r0.7.0/tutorial.html>

**Course Objective:** The main objective of this course is to

- Provide an overview of an exciting growing field of hyper text pre processor
- Analyze the construction of a web page and relate how PHP and HTML combine to produce the web page.
- 

**Course outcome:** At the end of the course, student will be able to

- Understand the programming requirements viz., generic types and methods to perform data analysis
- Understand the existing technologies and the need of distributed files systems to analyze the php programming.

### **Course Contents :**

Unit-I Introduction to PHP Evaluation of Php: Basic Syntax Defining variable and constant Php, Data types, Operator and Expression, Handling Html Form With Php, Capturing Form.

Unit-II Data Dealing with Multi-value filed: Generating File uploaded form, Redirecting a form after submission, Decisions and loop Making, Decisions Doing Repetitive task with looping, Mixing Decisions and looping with Html.

Unit-III Function: What is a function, Define a function Call by value and Call by reference, Recursive function. String: Creating and accessing String, Searching & Replacing String, Formatting String, String Related Library function.

Unit-IV Array: Anatomy of an Array, Creating index based and Associative array, Accessing array, Element Looping with Index based array, Looping with associative array, using each() and foreach(), Some useful Library function.

Unit-V Working with file and Directories: Understanding file & directory, Opening and closing a file, Copying ,renaming and deleting a file, Working with directories, Building a text editor, File Uploading & Downloading, Generating Images with PHP.

**Course learning outcome:** The course learning outcomes are designed to specify what the students will be able to perform after completion of the course:

- Analyze the construction of a web page and relate how PHP and HTML combine to produce the web page.
- Compare and contrast PHP variable types, and relate the advantages and disadvantages of PHP variables with local or global scope.
- Formulate, design and create PHP control structures, including selection and iterative structures Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.

### **Text Books:**

- 1.The Joy of PHP Programming: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL

### **Reference Books:**

1. Head First PHP & MySQL

### **Web Resources:**

- [:https://hadoop.apache.org/](https://hadoop.apache.org/)
- Hive: <https://cwiki.apache.org/confluence/display/Hive/Home/>
- Piglatin: <https://pig.apache.org/docs/r0.7.0/tutorial.html>

**Course Code:** MCA2043

**Course Credit Hour:** 4hr

**Course Name:** Web Technologies

**Total Contact Hour:** 60hr

**Course Objective:** The main objective of this course is to

- Provide an overview of an exciting growing field of web technologies
- Introduce the tools required to manage and analyze new trend in WWW

**Course outcome:** At the end of the course, student will be able to

- Understand the programming requirements viz., generic types and methods to launch a website
- Identify the need based tools, viz., Pig and Hive and to handle
- Formulate an effective strategy to implement a successful web page

**Course Contents :**

Unit-I Introduction to Internet Basic : The Basic of the Internet, Concepts of Domain, IP Addressing, Resolving Domain Names, Overview of TCP/IP and its Services, WWW, web projects, web applications, Web Team, planning & process development.

Unit-II Designing Pages with HTML: Introduction to HTML, Essential Tags, Deprecated Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags, Color and Background of Web Pages, Lists and their Types, Attributes of Image Tag.

Unit-III Link: Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Different Section of a Page and Graphics, Footnote and e-Mailing, Creating Table, Frame, Form and Style Sheet.

Unit-IV DHTML: Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

Unit-V Web Page: Web Page Basics, Web Terminologies, Phases of Planning and Building Web Sites, The FTP, HTTP and WPP, Features, Web Page Views, Adding Pictures, Backgrounds, Links. Scripting language: Java script and VB script JDBC database.

**Course learning outcome:** The course learning outcomes are designed to specify what the students will be able to perform after completion of the course:

- Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
- Ability to select and implement web techniques and computing environment that are suitable for the applications under consideration.
- Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
- Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

**Text Books:**

1. Dick Oliver : Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. David Plotkin :How to Do Everything with Microsoft Office FrontPage 2003, TMH

**Reference Books:**

1. Dick Oliver : Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. David Plotkin :How to Do Everything with Microsoft Office FrontPage 2003, TMH

**Course Code :** MCA2044

**Course Credit Hour :** 4hr

**Course Name :** Distributed systems

**Total Contact Hour :** 60hr



## Course Objective :

- List the principles of distributed systems and describe the problems and challenges associated with these principles.
- Understand Distributed Computing techniques, Synchronous and Processes.
- Apply Shared Data access and Files concepts

## Course outcome :

- To provide hardware and software issues in modern distributed systems.
- To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.

## Course Description :

- Apply Distributed web-based system.
- Understand the importance of security in distributed systems

## Course Contents :

- **Unit – I: Fundamentals** Evolution of Distributed Computing Systems, System models, issues in design of Distributed- computing environment, web based distributed model, computer networks related to distributed systems and web based protocols
- **Unit – II: Message Passing** Inter process Communication, Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multi datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication
- **Unit – III: Distributed Shared Memory** Design and Implementation Issues of DSM, Granularity, Structure of shared memory space, Consistency Models, replacement Strategy, Thrashing, Other Approaches to DSM, Advantages of DS
- **Unit – IV: Synchronization** Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms.
- **Unit - V Distributed File Systems** Desirable Features of a good Distributed File Systems, File Models, File-Accessing Models, File- sharing Semantics, File-caching schemes, File Replication, Fault Tolerance, Design Principles, Sun's network file system, Andrews file system, comparison of NFS and AFS

## Course learning outcome :

- **CLO1** :Review of Networks, Operating Systems, Concurrent Programming, and Characteristics & Properties of Distributes Systems – Taxonomy - Design goals – Transparency Issues
- **CLO2** : basic Message Passing Model – The Client Server, Message Passing, RPC basics, RPC implementation, RPC communication
- **CLO3**:Communication in Distributed Systems, Socket Programming -Client Server examples, I/O Multiplexing, Inetd Super Server – Secure Sockets – The SSL & the Java Secure Socket Extension
- **CLO4** :Motivation, Object Replication, Consistency Models, Distribution Protocols –5Consistency Protocols
- **CLO5**: Desirable Features of a good Distributed File Systems, File Models, File-Accessing Models

## Text books :

1. Distributed OS by Pradeep K. Sinha (PHI)
2. Tanenbaum S. : Distributed Operating Systems, Pearson Education

**Reference books :**

- 1.Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms. (Pearson Education)
- 2.George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems concepts and design

**Online links for study & reference material**

<https://www.ict.gnu.ac.in/content/2cse50e2-distributed-systems-elective-i>

**Course Code:** MCA2051  
**Course Credit Hour:** 4hr

**Course Name:** Software engineering  
**Total Contact Hour:** 60hr

## Course Objective:

- Software Engineering (SE) comprises the core principles consistent in software construction and maintenance: fundamental software processes and life-cycles, mathematical foundations of software engineering, requirements analysis, software engineering methodologies and standard notations, principles of software architecture and re-use, software quality frameworks and validation, software development, and maintenance environments and tools. iterative development, interpretation of requirements and use case documents into code; application of design notation in UML and use of commonly-used design patterns. Current industry-strength programming languages, technologies and systems feature highly in the practical components, electives and projects of the course, but they are also taught with a view to understanding and applying principles underlying their more ephemeral character.

## Course outcome :

- Learn the theory and foundations of software engineering.
- Learn the different process models and choose the best model for their project
- Be able to construct requirement models
- Be able to Understand the different development practices and its advantages.
- Be able to create test cases and implement different testing strategies

## Course Description :

- Knowledge of basic SW engineering methods and practices, and their appropriate application.
- . Describe software engineering layered technology and Process frame work. 3
- . A general understanding of software process models such as the waterfall and evolutionary models. Understanding of software requirements and the SRS documents. Understanding of the role of project management including planning, scheduling, risk management, etc.
- Describe data models, object models, context models and behavioural models. Understanding of different software architectural styles. Understanding of implementation issues such as modularity and coding standards. Understanding of approaches to verification and validation including static analysis, and reviews.

## Course Contents :

- **Unit-I: Introduction** Software life cycle models: Waterfall, Prototype, Evolutionary and Spiral models, Overview of Quality Standards like ISO 9001.
- **UNIT-II :Software Metrics and Project Planning** Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics, Information Flow Metrics. Cost estimation, static, Single and multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk management.
- **UNIT- III:Software Requirement Analysis, design and coding** Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design Top-down and bottom-up Structured programming, Information hiding.
- **UNIT- IV : Software Reliability, Testing and Maintenance** Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional

testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing: path testing, Data flow and mutation testing, unit testing, integration and system testing, Debugging, Testing Tools, & Standards. Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering.

➤ **UNIT- V : UML:** Introduction to UML, Use Case Diagrams, Class Diagram: State Diagram in UML Activity Diagram in UML. Sequence Diagram in UML Collaboration Diagram in UML

**Course learning outcome :**

- **CLO1 :** Understand basic SW engineering methods and practices, and their appropriate application.
- **CLO2:** Understand u of software process models such as the waterfall and evolutionary 10. models.
- **CLO3:** problem analysis and description, This unit is to introduce Discuss data models, object models, context models and behavioural models.
- **CLO4 :** Understand of different software architectural styles and Process frame work
- **CLO5:** this unit is for learning different modes of file storage. Records and there usage .

**Text books :**

1 K. K. Aggarwal & Yogesh Singh, .Software Engineering., 2nd Ed, New Age International, 2005.

2.R. S. Pressman, —Software Engineering – A practitioner’s approach, 5th Ed., McGraw Hill Int. Ed., 2001.

**Online links for study & reference materials :**

[https://www.vssut.ac.in/lecture\\_notes/lecture1428551142.pdf](https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf)

**Course Code:** MCA2052

**Course Credit Hour:** 4hr

**Course Name:** Microprocessor and assembly language

**Total Contact Hour:** 60hr

**Course Objective:** To Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.

**Course outcome :**

- Learn the theory and foundations of microprocessor and assembly language
- Learn the different process models and choose the best model for their project

**Course Description :**

- Know the various functional units of 8051 microcontroller.
- Understand microcontroller based system design for various applications.

**Course Contents :**

- **Unit-I** Fundamental Micro-processor: overview of intel pro-pentium Motorola 68000 series, power PC, DEC-Alphacip; CISC architecture.
- **UNIT-II** :Basic microprocessor architecture and interface: Internal architecture, external system bus architecture, memory and Input/output interface.
- **UNIT- III**:Programming mode: General-purpose registers; pointer and index registers; flag; segment registers, program invisible registers; memory addressing and addressing modes.
- **UNIT- IV** : Memory interfacing; memory address decoding; cache memory and cache controllers. Basic I/O interface; I/O mapped I/O memory mapped I/O; basic input/output and handshaking input/output port address decoding; 8255 programmable peripheral interface; 8279 programmable keyboard and display interface; 8254 programmable timer; 8251 programmable/ communication interface
- **UNIT- V** : interrupts-interrupt vector, vector tables, hardware and software Interrupts, 8259 programmable Interrupts controller; real-time clock; direct memory access, 8237/ 8257 DMA controller; video controllers; shared bus operation.

**Course learning outcome :**

- **CLO1** : Know the various peripheral devices such as 8255, 8279, 8251, 8253, 8259 and 8237
- **CLO2**: Understand embedded C and assembly language program by using 8051 Instruction sets and addressing modes.

**Text books :**

1 Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India

3. Gill, Nasib Singh and Dixit J.B., “Digital Design and Computer Organisation”

**Online links for study & reference materials :**

<https://www.veltech.edu.in/syllabi/SoEC/EEE/PROGRAMMECORE/1151EE113MICROPROCESSORANDMICROCONTROLLER.pdf>

**Course Code:** MCA2053

**Course Credit Hour:** 4hr

**Course Name:** cyber law and security

**Total Contact Hour:** 60hr

**Course Objective:** the increasing number of networked information technologies— including internet of things (IoT), wearables, ubiquitous sensing, social sharing platforms, and other AI-driven systems—are generating a tremendous amount of data about individuals, companies, and societies. These technologies offer enormous benefits but also create enormous risks to individual privacy and national security. Further, the ease with which data can be collected from online sources, analyzed, and inferences drawn about individual users raises a wide range of ethical questions about these technologies, their creators, and their users.

**Course Outcome:**

- Identify and explain basic ethical and policy-based frameworks for working with big data and apply these frameworks to real-world cases.

**Course Description:**

- The subject is very important in forming the basics for algorithms, complexity and computational theory. The concept of Boolean algebra is useful in not only creating logical solution but is very important as a critical programming skill too.

**Course Contents:**

**Unit - I: What are Ethics?** :Unit 1 of this course establishes a basic foundation in the notion of simple utilitarian ethics we use for this course. The lecture material and the quiz questions are designed to get most people to come to an agreement about right and wrong, using the utilitarian framework taught here. In this module we will talk about the laws that govern the Principle of Informed Consent. We will also discuss why informed consent doesn't work well for retrospective studies, or for the customers of electronic businesses.

**Unit - II: Data Ownership Privacy** :Who owns data about you? We'll explore that question in this unit. A few examples of personal data include copyrights for biographies; ownership of photos posted online, Yelp, Trip Advisor, public data capture, and data sale. We'll also explore the limits on recording and use of data. We have seen the rise different value systems with regards to privacy. In this unit the relationship between the services we are provided and the data we provide in exchange

**Unit - III: Data Validity and Algorithmic Fairness** Data validity is not a new concern. All too often, we see the inappropriate use of Data Science methods leading to erroneous conclusions. This module points out common errors, in language suited for a student with limited exposure to statistics. We'll focus on the notion of representative sample: opinionated customers. Only recently have people begun to think about how algorithmic decisions can be unfair.

**Unit - IV: Societal Consequences and attributions** , This unit is focused on considering societal consequences of Data Science that we should be concerned about even if there are no issues with fairness, validity, anonymity, privacy, ownership or human subjects research. These “systemic” concerns are often the hardest to address, yet just as important as other issues discussed before. This unit also focuses on ossification, or the tendency of algorithmic methods to learn and codify the current state of the world and thereby make it harder to change. Information asymmetry has long been exploited for the advantage of some, to the disadvantage of others. Information technology makes spread of information easier, and hence generally decreases asymmetry. However, Big Data sets and sophisticated analyses increase asymmetry in favor of those with ability to acquire/access.

**Course learning outcome:**

**CO1.**Identify situations where data is sensitive, assess the risks, and describe how various stakeholders could respond to those risks.

**CO-2** Describe how to minimize privacy/security compromises through the data lifecycle (from collection through dissemination).

**Text books:**

- The code book simon singh tata mcgrawhill

**Online links for study & reference materials :**

- <http://vbtmca.ac.in/SYLLABUS/Sem%203/639402.pdf>

**Course Credit Hour : 4hr**

**Total Contact Hour : 60hr**

**Course Objective :**

- The goal of this course is for students to maintain an appropriate level of awareness, knowledge and skill on the disciplines of technology, business and law to allow them to minimize the occurrence and severity of information security incidents. The students will learn techniques used to detect, respond to, and prevent network intrusions.
- The course bear a strong adherence to computer based technological skills and capabilities, and thereby resulting in efficiency to handle a variety of issues related to Information and Cyber Security in any organization.

**Course Description :**

- Understanding Intelligence
- Understanding Cyber Threat Intelligence

**Course Contents :**

- **Unit – I:** History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages.
- **Unit – II:** Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles. Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E- Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.
- **Unit – III:** .Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges.
- **Unit – IV:** Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies. Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection.
- **Unit - V** Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types & overview of Cyber Crimes, Cyber Law Issues in E-Business Management. Overview of Indian IT Act, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical hacking.

**Course learning outcome :**

- **CLO1 :** Threats, Attacks, Services and Mechanisms, Security Attacks, Security Services, Integrity check, digital Signature, authentication, Spoofing, Sniffing, Firewall.
- **CLO2 :** Have a basic knowledge of the use of confidentiality , data integrity .
- **CLO3:** To understand Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control-



- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics.
- **CLO4** :Techniques, Mathematical foundation, Stream Ciphers, Block Ciphers, Cryptanalysis, Hash Algorithms.
  - **CLO5**: Block Encryption, DES rounds, S-Boxes IDEA: Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES. Hash Functions and Message Digests:

**Text books :**

1. Godbole, “ Information Systems Security”, Willey
- 2 .Merkov, Breithaupt, “ Information Security”, Pearson Education

**Reference books :**

- 1 .Yadav, “Foundations of Information Technology”, New Age, Delhi
2. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill
3. Sood, “Cyber Laws Simplified”, Mc Graw Hill
4. Furnell, “Computer Insecurity”, Springer.

**Online links for study & reference materials :**

[https://www.vssut.ac.in/lecture\\_notes/lecture1423183198.pdf](https://www.vssut.ac.in/lecture_notes/lecture1423183198.pdf)

**MCA-251: Advance Java- Lab**

**MCA-255: DSE3 Lab**

## SEMESTER 3

**Course Code:** MCA301  
**Course Credit Hour:** 4hr

**Course Name:** Machine learning using Python Programming  
**Total Contact Hour:** 60hr

### **Course Objective:**

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python.
- To develop the skill of designing Graphical user Interfaces in Python.
- To develop the ability to write database applications in Python.

**Course outcome:** At the end of the course, student will be able to

- Understand and comprehend the basics of python programming.
- Demonstrate the principles of structured programming and be able to describe, design, implement, and test structured programs using currently accepted methodology.
- Explain the use of the built-in data structures list, sets, tuples and dictionary.
- Make use of functions and its applications.
- Identify real-world applications using oops, files and exception handling provided by python.

### **Course Description:**

- This course includes an overview of the various tools available for writing and running Python, and gets students coding quickly. It also provides hands-on coding exercises using commonly used data structures, writing custom functions, and reading and writing to files.

### **Course Contents:**

- **Unit – I: Introduction:** History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.
- **Unit – II: Types, Operators and Expressions:** Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass
- **Unit – III: Data Structures-**Lists- Operations, Slicing, Methods, Tuples, Sets, Dictionaries, Sequences, Comprehensions.
- **Unit – IV: Functions** - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables, **Modules:** Creating modules, import statement, from. Import statement, name spacing.  
**Python packages,** Introduction to PIP, Installing Packages via PIP, Using Python Packages
- **Unit - V Object Oriented Programming OOP in Python:** Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.  
**Error and Exceptions:** Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User defined Exceptions.

**Brief Tour of the Standard Library** - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics.

**Testing:** Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

**Course learning outcome:**

- **CLO1:** To acquire programming skills in core Python.
- **CLO2:** To acquire Object Oriented Skills in Python
- **CLO3:** To develop the skill of designing Graphical user Interfaces in Python
- **CLO4:** To develop the ability to write database applications in Python
- **CLO5:** To develop the ability to write database applications in Python

**Text books:**

1Yang, “Applied Numerical Methods using MATLAB”, Wiley India

2Pradip Niyogi, “Numerical Analysis and Algorithms”, TMH, 1st Edition. Gerald & Whealey, “Applied Numerical Analyses”

**Reference books :**

1Grewal B S, “Numerical methods in Engineering and Science”, Khanna Publishers, Delhi.

**Online links for study & reference materials :**

<https://ocw.mit.edu/courses/mathematics/18-330-introduction-to-numerical-analysis-spring-2012/lecture-notes/>

**Course Code :** MCA302  
**Course Credit Hour :** 4hr

**Course Name :** Adv. Dot (.) NET Framework  
**Total Contact Hour :** 60hr

**Course Objective :**

- Theory provides a simple, elegant view of the complex machine that we call a computer. Theory possesses a high degree of permanence and stability, in contrast with the ever-changing paradigms of the technology, development, and management of computer systems. Further, parts of the theory have direct bearing on practice, such as Automata on circuit design, compiler design, and search algorithms; Formal Languages and Grammars on compiler design; and Complexity on cryptography and optimization problems in manufacturing, business, and management.

**Course outcome :**

- Learn the theory and foundations of .net programming
- Learn the different process of syntax creation of high level language

**Course Description :**

- The goal of this course is to introduce the students to the basics of distributed application development. We will introduce the students to Web Service development and . NET remoting.
- enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

**Course Contents :**

**UNIT - I** C# Fundamentals: Basic classes, declarations, conditionals, loops, arrays, strings, enumerations, structures, and Encapsulation, inheritance, polymorphism, Structured exception handling. Understanding interface types

**UNIT - II** Delegates, Events, and Lambdas: basics of each -- very important for event driven (GUI), Understanding the garbage collector, creating and working with .NET assemblies.

**UNIT - III** Windows Forms and WPF: Basic windows programming: forms, component class, control class, control events, menus, status bars, tool bars, interacting with the registry. Indexers, Operator Overloading, Custom Type Conversion, Extension Methods, Anonymous Types, Pointer Types

**UNIT - IV** Input, Output, and Serialization: System.IO, Directory and File Types, StreamReaders and StreamWriters, working with binary data, configuring objects for serialization, Working with and creating custom generic types. UNIT - IV Processes, AppDomains, Contexts, Threading, Type Reflection, Late Binding, Attributebased programming: Advanced topics from the text will be discussed as time permits. We can decide as a class on what to explore if we get to this point.

**Course learning outcome :**

- **CLO1 :** Mathematical tools, Definitions, theorems, and proofs
- **CLO2:** cross-platform, open source developer platform for building many different types of applications.

**Text books :**

- 1.Wiley India VB.Net Step By Step, Michael Halvorson, PHI.

**Reference books:**

1. VB.Net programming Black Book, by Kogent Learning Solutions
2. Wiley Publications Beginning VB.Net (Wrox)

**Online links for study & reference materials :**

<http://www.cs.virginia.edu/~robins/cs3102/CS3102>

**Course Code :** MCA303  
**Course Credit Hour :** 4hr

**Course Name :** Theory of computation  
**Total Contact Hour :** 60hr

**Course Objective :**

- Theory provides a simple, elegant view of the complex machine that we call a computer. Theory possesses a high degree of permanence and stability, in contrast with the ever-changing paradigms of the technology, development, and management of computer systems. Further, parts of the theory have direct bearing on practice, such as Automata on circuit design, compiler design, and search algorithms; Formal Languages and Grammars on compiler design; and Complexity on cryptography and optimization problems in manufacturing, business, and management.

**Course outcome :**

- Learn the theory and foundations of machine learning
- Learn the different process of syntax creation of low level language

**Course Description :**

introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.

- enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

**Course Contents :**

- **Unit – I:** Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem
- **Unit – II:** Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.
- **Unit – III:** Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.
- **Unit – IV:** Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

- **Unit - V** :Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

**Course learning outcome :**

- **CLO1** : automata, computability, and complexity ,Mathematical tools, Definitions, theorems, and proofs
- **CLO2**: .Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression
- **CLO3**: Understand recursive and recursively enumerable languages.
- **CLO4** :Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack
- **CLO5**: Understand Turing Machines and the simple primitive mechanisms needed for all computation

**Text books :**

- 1.Hopcroft, Ullman, "Introduction to Automata Theory,Languages and Computation", Pearson Education .
- 2.K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languagesand Computation", PHI Learning Private Limited, Delhi India.

**Reference books:**

- 1.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
- 2.Y.N.Singh "Mathematical Foundation of Computer Science", New Age International.

**Online links for study & reference materials :**

<http://www.cs.virginia.edu/~robins/cs3102/CS3102>

**MCA351 :LAB based on Machine learning using Python**

**MCA352:LAB based on .Net Framework**

**MCA353: industrial seminar**

**MCA354 : minor project**

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## SEMESTER 4

**Course Code:** MCA401  
**Course Credit Hour:** 4hr

**Course Name:** Advance Database Management system  
**Total Contact Hour:** 60hr

### **Course Objective:**

- This course introduces database design and creation. Emphasis is on data dictionaries, normalization, data integrity, data modelling, and creation of simple tables, queries, reports, and forms. Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms.

### **Course Outcome:**

- The students will understand the fundamentals of relational, object-oriented, and distributed database systems including data models, database architectures, and database manipulations.
- Understand the theories and techniques in developing database applications and be able to demonstrate the ability to build databases.

### **Course Description:**

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
- To understand and use data manipulation language to query, update, and manage a database
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

### **Course Contents:**

- **Unit - I:** Data base system vs. file system, data models, relational model, database languages, DDL, DML, database access for applications programs, data base users and administrator, transaction management, history of data base systems, data base design and ER diagrams, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER model, and conceptual design for large enterprises, Codd's Rules.
- **Unit - II:** Data Base Design: Functional Dependency and Decomposition - Functional Dependency - Decomposition. Normalization - Introduction - Normalization - Normal Forms 1NF, 2NF, 3NF - BCNF - 4NF - 5NF.
- **Unit - III:** Examples of basic SQL queries, nested queries, correlated nested queries set, comparison operators, aggregative operators, NULL values, comparison using null values, logical connectivity, AND, OR and NOTR, impact on SQL constructs, outer joins, disallowing NULL values, complex integrity constraints in SQL triggers and active data bases.
- **Unit - IV:** Data Base Recovery Systems: Introduction - Recovery Concepts - Types of Failures - Types of Recovery - Recovery Techniques - Buffer Management. Data Base Security: Goals - Firewalls - Data Encryption

- **Unit - V:** ACID properties, transactions and schedules, concurrent execution of transaction, lock based concurrency control, performance locking, and transaction support in SQL, crash recovery, concurrency control, Serializability and recoverability, lock management, lock conversions, dealing with dead locks, specialized locking techniques, concurrency without locking, crash recovery:

**Course learning outcome:**

- **CLO1** : this unit is to create understanding of Defining program-data independence, data models for database systems, database schema
- **CLO2:** the learning objective here is to Recall Relational Algebra concepts, and use it to translate queries to Relational Algebra statements and vice versa. Identify Structure Query Language statements used in creation and manipulation of Database Identify the methodology of conceptual modeling through Entity Relationship model.
- **CLO3:** Identify the methodology of logical model. Identify the methodology of physical model
- **CLO4:** Develop an understanding of the differences between OODBMS, ORDBMS and RDBMS and the practical implications of each approach.
- **CLO5** :Analyze and design a real database application. Develop and evaluate a real database application using a database management system

**Text books:**

1. Elmasri Navathe, Data Base Management System, Pearson Education, 2008.
2. 2.S.K. Singh, “Database Systems Concepts, Design and Applications”, Pearson Education Pte. Ltd., New Delhi: 2006.
3. 3.C. J. Date, Introduction to Database Systems, Pearson Education, 2009.

**Reference books:**

1. Silberschatz, Korth, Database System Concepts, McGraw hill, 5th edition, 2005.
2. Rob, Coronel & Thomson, Database Systems Design: Implementation and Management, 2009.

**Online links for study & reference materials:**

<https://lecturenotes.in/subject/38/database-management-system-dbms>



**Course Code :** MCA402  
**Course Credit Hour :** 4hr

**Course Name :** Full Stack Development Technologies  
**Total Contact Hour :** 60hr

**Course Objective :** From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client.
- Write backend code in Python/Java, PHP languages and Writing optimized front end code HTML and JavaScript.
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement.
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution.

**Course outcome:** At the end of the course, student will be able to

- Identify the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Creating & Running Applications using JSP libraries
- Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng-form
- Working with the Files in React JS and Constructing Elements with Data

**Course Contents:**

- **UNIT – I: HTML** Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers.

**Markup Languages:** XHTML an Introduction to HTML, History, Versions, Basic, XHTML Syntax and Semantics Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.

- **UNIT – II: Cascading Style Sheets (CSS)** Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout beyond the Normal Flow-CSS3.0, Boot strap basics, Boot strap CSS3, Introduction to Java Script, Jscript basics, JScripts objects, JSON, Don.

- **UNIT – III: Jscript** Separating Programming and Presentation: JSP Technology, Introduction to JSP and Servlets-Running JSP Applications, Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm- Mongo DB, JQuery, Mean stack Fundamentals

- **UNIT – IV: Angular Js** Introducing AngularJS, Starting Out with AngularJS, Basic AngularJS, Directives and Controllers, AngularJS Modules, Creating First Controller, working with and Displaying, Arrays, more Directives, working with ng-repeat, Unit Testing in AngularJS, Forms, Inputs, and Services, Working with ng-model, Working with Forms, Leverage Data-Binding and Models, Form Validation and States, Error Handling with Forms, ngModelOptions, Nested Forms with ng-form, Other Form Controls.

- **UNIT – V: React JS** Introduction to React, Obstacles and Roadblocks, keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories

**Course learning outcome:**

- **CLO1:** Introduction to HTML (web essential and markup languages).
- **CLO2:** Introduction to Cascading Style sheets
- **CLO3:** Introduction to Jscript
- **CLO4:** Introduction to Angular Js.
- **CLO5:** Introduction to React Js.

**Text Books:**

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007
3. AngularJS: Up and Running Enhanced Productivity with Structured Web Apps By Brad Green, Shyam Seshadri Publisher: O'Reilly Media

**Reference books:**

1. Learning React Functional Web Development with React and Redux By Alex Banks, Eve Porcello Publisher: O'Reilly Media
2. Head First Java, 2nd Edition by Bert Bates, Kathy Sierra Publisher: O'Reilly Media, Inc

**Course Code :** MCA403

**Course Credit hour :** 4hr

**Course Objective :**

- To create an understanding in the mind of the student regarding formal and professional communication practised in a professional environment .
- To familiarize students with the concept of entrepreneurship and practices.

**Course outcome :**

- Master the art of a professional business presentation.
- Distinguish different communication process and its practical application
- To understand various functions and outcomes of entrepreneurial activities.

**Course Description:**

- In the present industrial scenario the role of entrepreneurship and communication is becoming more vital day by day specially in case of More advanced, industries where client interaction plays a major role. The concept of entrepreneurship and turning a mere business idea into a full fledged project requires highly skilled approach towards not just communicating but realizing the business. This course will present an opportunity towards the students to learn corporate interactions in a highly competitive corporate world. Along with learning various processes involved in running an enterprise.

**Course Contents :**

**Unit-I:(Business Communication) :** Difference between general and business communication, this should cover general and technical writing, oral communications and listening skill

**Unit-II: (Expression)** Practical communication skill development, business presentation with multimedia, speaking skill, prepared speech, extempore speech

**Unit-III:(concept of entrepreneurship) :** functions and classifications of entrepreneurs , characteristics of entrepreneurs , women entrepreneurs ,

**UNIT-IV: (concept of project):** classification of project identification , project formulation , project report -project design-project appraisal-profitability appraisal -project planning - cost benefit analysis .

**UNIT-V:(financial analysis):** budget planning- process ,break even analysis ,profitability analysis , applicability of factories act.

**Course learning outcome :**

**CO1.** this unit is for understanding general business communication.

**CO2.** this unit is for understanding skill development and confidence development.

**CO3.** various entrepreneurship practices are learned in this unit, along with an insight into the struggles and challenges of women entrepreneurs .

**CO4.** this unit is for creating an understanding of how a project is planned and executed.

**CO5.** budget planning and execution is explained in this unit.

**Text books :**

1. Business Correspondence & Report writing, Sharma, TMH 2. Business Communication Strategies, Monipally, TMH
2. Entrepreneurial development , Vasant Desai , Himalaya publishing house.

**Online links for study & reference materials :**

- <https://mgdic.files.wordpress.com/2016/12/3361704-industrial-data-communication.pdf>
- <http://www.simplynotes.in/e-notes/mbabba/entrepreneurship-development/>

**MCA451 : Advance DBMS lab**

**MCA 452: Full Stack Development Technologies lab**

**Major Project**