NOIDA INTERNATIONAL UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE

SYLLABUS OF COURSES TO BE OFFERED

M.Sc.–COMPUTER SCIENCE

UNDER CBCS

(Academic Session: 2021-22)

Preamble

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system. However, due to lot of diversity in the system of higher education, there are multiple approaches followed by universities towards examination, evaluation and grading system. While the HEIs must have the flexibility and freedom in designing the examination and evaluation methods that best fits the curriculum, syllabi and teaching–learning methods, there is a need to devise a sensible system for awarding the grades based on the performance of students. Presently the performance of the students is reported using the conventional system of marks secured in the examinations or grades or both. The conversion from marks to letter grades and the letter grades used vary widely across the HEIs in the country. This creates difficulty for the academia and the employers to understand and infer the performance of the students graduating from different universities and colleges based on grades.

The grading system is considered to be better than the conventional marks system and hence it has been followed in the top institutions in India and abroad. So, it is desirable to introduce uniform grading system. This will facilitate student mobility across institutions within and across countries and also enable potential employers to assess the performance of students. To bring in the desired uniformity, in grading system and method for computing the cumulative grade point average (CGPA) based on the performance of students in the examinations, the UGC has formulated these guidelines.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

Outline of Choice Based Credit System:

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

2.1 Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

2.2 Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

2.3 Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real-life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

Course and programme outcome of M.Sc -CS

Profile

- The mission is to impart employability and creativity to the students, to live up to the standards of IT industry.
- Experienced faculty members with good capabilities.
- Faculty members with ample Industry experience and profound caliber.
- Valuable lectures delivered by renowned personalities from the reputed Industries, for the benefit of the students.
- 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.Sc. (Computer Science)- 2 Years

VISION

To be the source of bringing out globally competent pioneering computing professionals, researchers, innovators and entrepreneurs and thereby succeed and contribute value to the knowledge-based economy and society.

MISSION

- To offer high-grade, value-based Post-graduate programme in the field of Computer Science.
- To provide conducive environment so as to achieve excellence in teaching-learning, and research and development activities.
- To bridge the gap between industry and academia by framing curricula and syllabi based on industrial and societal needs.
- To offer tasks for experiential technology-intensive knowledge through collaborative and interdisciplinary activities.
- To provide appropriate forums to develop innovative talents, practice ethical values and inculcate as enduring learners.
- To facilitate students to nurture skills to practice their professions competently to meet the ever-changing needs of society

Programme Educational Objective

PEOs of M.Sc programme are:

M.Sc.-CS programme of Noida International University will prepare its students for

PEO 1: To progress their career productively in software industry, academia, research, entrepreneurial pursuit, government, consulting firms and other Information Technology enabled services.

PEO 2: To achieve peer-recognition; as an individual or in a team; by adopting ethics and professionalism and communicate effectively to excel well in cross culture and inter-disciplinary teams.

PEO 3: To continue a lifelong professional development in computing that contributes in self and societal growth.

Programme Outcome: On completion of M.Sc degree, the graduates will be able to

PO1. Apply the knowledge of mathematics and computing fundamentals to various real life applications for any given requirement

PO2. Design and develop applications to analyze and solve all computer science related problems

PO3. Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects

PO4. Analyze and review literatures to invoke the research skills to design, interpret and make inferences from the resulting data

PO5. Integrate and apply efficiently the contemporary IT tools to all computer applications

PO6. Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations

PO7. Involve in perennial learning for a continued career development and progress as a computer professional

PO8. Function effectively both as a team leader and team member on multi-disciplinary projects to demonstrate computing and management skills

PO9. Communicate effectively and present technical information in oral and written reports

PO10. Utilize the computing knowledge efficiently in projects with concern for societal, environmental, and cultural aspects

PO11. Function competently as an individual and as a leader in multidisciplinary projects

PO12. Create and design innovative methodologies to solve complex problems for the betterment of the society

PO13. Apply the inherent skills with absolute focus to function as a successful entrepreneur.

NOIDA INTERNATIONAL UNIVERSITY
SCHOOL OF SCIENCES

Study & Evaluation Scheme for M.Sc. -Computer Sciences
Effective from the Session: 2021-2022

M.Sc.- Computer Sciences 1st Year
SEMESTER-I

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
									External Exam		
			L	T	P	CA	TA	Total			
1	MCS-101	Problem Solving With C	3	1	0	20	20	40	60	100	4
2	MCS-102	Data Mining & data Warehousing	3	1	0	20	20	40	60	100	4
3	MCS-103	Adv. Computer Organization & Architecture	3	1	0	20	20	40	60	100	4
4	MCS-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	MCS-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
Practical											
1	MCS-151	Problem Solving With C Lab	0	0	2	20	20	40	60	100	2
Total										**600**	**24**

M.Sc.- Computer Sciences 1st Year
SEMESTER-II

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
									External Exam		
			L	T	P	CA	TA	Total			
1	MCS-201	Adv. C++	3	1	0	20	20	40	60	100	4
2	MCS-202	Adv. Data Structure	3	1	0	20	20	40	60	100	4
3	MCS-203	Artificial Neural Networks	3	1	0	20	20	40	60	100	4
4	MCS-204X	DSE-3 (Choose any one) 1. Big Data Analytics 2. PHP Programming 3. Web Technologies 4. Information Security	3	1	0	20	20	40	60	100	4
5	MCS-205X	DSE-4 (Choose any one) 1. Numerical Analysis 2. Microprocessor & Assembly Language 3. Natural Language Processing 4. Mobile Computing	4	1	0	20	20	40	60	100	5
Practical											
1	MCS-251	Adv. C++ lab	0	0	2			40	60	100	2
2	MCS-255X	DSE-3 Lab	0	0	2			40	60	100	2
Total										**700**	**24**

*** Mandatory Internship/ Industrial Training (Minimum 4-6 weeks) during summer break**

M.Sc.- Computer Sciences 2nd Year
SEMESTER-III

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
									External Exam		
			L	T	P	CA	TA	Total			
1	MCS-301	Python Programming	3	1	0	20	20	40	60	100	4
2	MCS-302	Adv. Dot (.) NET Framework	3	1	0	20	20	40	60	100	4
3	MCS-303	Adv. Operating Systems	3	1	0	20	20	40	60	100	4
Practical											
1	MCS-351	Python Programming Lab	0	0	4	20	20	40	60	100	2
2	MCS-352	Dot (.) NET Framework Lab	0	0	4	20	20	40	60	100	2
3	MCS-353	Industrial Seminar	0	0	4	50	50	100	00	100	2
4	MCA-354	Minor Project	0	0	8	20	20	40	60	100	4
Total										**700**	**22**

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

SEMESTER-IV

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
									External Exam		
			L	T	P	CA	TA	Total			
1	MCS-401	Advanced DBMS	3	1	0	20	20	40	60	100	4
2	MCS-402	Cryptography & Network Security	3	1	0	20	20	40	60	100	4
3	MCS-403	Entrepreneurship Development	3	1	0	20	20	40	60	100	4
Practical											
1	MCS-451	Advanced DBMS Lab	0	0	2	20	20	40	60	100	2
2	MCS-452	Cryptography & Network Security Lab	0	0	2	20	20	40	60	100	2
3	MCA-354	Major Project	0	0	2	50	50	100	100	200	6
Total										**700**	**22**

Note: Choices from the other department/School can also be considered.

OVERALL CREDIT SCHEME

S. No.	SEMESTER	Theory Total	Practical Total	Subject Total	Total Credit
1	I	500	100	600	24
2	II	500	200	700	24
3	III	300	400	700	22
4	IV	300	400	700	22
			Grand Total	**2500**	**92**

Assessment method : (Continuous Internal Assessment = 40% , Final Examination = 60%)	
Assessments	**Weightage**
Assessment -1	05%
Assessment -2	05%
Assessment -3	20%
Assessment -4	05%
Assessment -5	05%
Total Internal Assessment	**40%**

Course Code: MCS101 **Course Name:** Problem solving with C

Course Credit hour: 4hr **Total Contact Hour :** 60hr

Course Objective:

- The course is intended to create an understanding of the fundamentals of high-level structural programming concepts through the medium of C language.
- C language is a general purpose, procedural computer programming language.

Course Outcome:

- The students will be able to solve problems systematically and to implement the solution in C language.
- Develop programming skills.
- Develop the knowledge of how to learn a programming language, which will help in learning other Computer Languages in the curriculum

Course Contents:

Unit – I: C Fundamentals: Character Set, Identifier & Keywords, Data Types, Variables, Operatorsand expressions, Symbolic Constants, Preprocessor Directives, and Library Functions.

Unit – II: Control Structure and Functions: If statement, if-else statement, nested if-else, conditional operators, while, do-while and for loop, multiple initializations of for loop, break and continue statement. Function definition, passing values between functions, call by value and call by reference.

Unit – III: Arrays and Structure: Definition and classification of arrays, string definition and standard library string functions, defining a structure, Array vs Structure, Initialization of a structure, Nested structure.

Unit – IV: Pointers and File Handling: Pointers variables, Pointer operator, array of pointer, pointers to functions, dynamic allocation functions, File I/O: Types of I/O, console I/O functions sfrintf() and sscanf() functions, file operations, file opening modes, record I/O in files

Course learning Outcome:

- **CLO1:** this unit is to develop an understanding of basic character sets keywords and identifiers used for the c programming dataset. Learning objective of this unit is defining data types and uses them in simple data processing applications.
- **CLO2:** the learning objective here is to identify and put to use basic loops, conditional loops and iterative loops. Various break statements and call by value and reference are understandable in this unit.
- **CLO3:** This unit is to classify basic arrays and structures, various standard library functions, nested structures etc.
- **CLO4:** this unit is for learning console I/O, various functions and modes for file opening closing and recording I/O.

Textbooks:

1.Let Us C: Yashvint Kanitkar[BPB]
2.C The Complete Reference,rdSchildt, TMH
3.Practical C Programming,3 Ed,Oualline,SPD/O'REILLY

Reference books:

1. Programming in C, Schaum Outline, McGraw-Hill 3
2. Lab Manual for Basic Linux commands, to be provided by the department

Online links for study & reference materials:

https://lecturenotes.in/download/note/18532-note-for-cprogramming-by-anshuman

Course Code : MCS102 **Course Name :** Data Mining and Warehousing
Course Credit Hour : 4hr **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, 8 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: MCS103 **Course Name:** Advance Computer organization & architecture
Course Credit :4 hrs **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 PrenticeHall,2007.

Online links for study & reference materials :

- http://www.cse.iitm.ac.in/~vplab/courses/comp_org/LEC_INTRO.pdf

Course Code: MCS1041 **Course Name:** Cloud computing

Course credit : 4 hrs **total contact hours : 60 hrs**

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: MCS1042 **Course Name:** Operation Research **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 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: MCS1043 **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 Simle 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,

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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: MCS1044 **Course Name:** Data compression

Course Credit Hour: 4h **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 con-cept 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: Movetofront coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

UNIT IV :Distortion criteria, Models, Scalar Ouantization: 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 VectorQuantizers.

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:

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

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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: MCS1051 **Course Name:** Discrete Mathematics Structure
Course Credit Hour: 4hr **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, 5th edition. TMH

Reference Books:

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

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Online links for study & reference materials :

- https://mathworld.wolfram.com/DiscreteMathematics.html

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

Course Code: MCS1052 **Course Name:** Machine Learning
Course Credit Hour: 4hr **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 Srinivarasaraghavan, Vincy Joseph Machine Learning Wiley India

Online links for study & reference materials :

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

Course Code: MCS1053 **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.

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- **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: MCS1054 C**ourse Name:** Advance industrial communication
Course Credit Hour: 4hr **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 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.

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. programmers 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

MCS-151- problem solving with C

Course Code : MCS201 **Course Name :** Advance C++
Course Credit Hour : 4hr **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 C++
- C++ 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.

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

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 medhology 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.

Reference books :

1.The Unified Modeling Language User Guide - Grady Booch, James Rumbaugh, Ivar Jacobson.
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**

Course Code: MCS202 **Course Name:** Advance data structures

Course Credit Hour: 4hr **Total Contact Hour:** 60hr

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 Code: MCS203 **Course Name:** Neural networks

Course Credit Hour: 4hr **Total Contact Hour:** 60hr

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: MCS2041 **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 Code: MCA2042 **Course Name:** PHP programming
Course Credit Hour: 4hr **Total Contact Hour:** 60hr

Course Objective:

- 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:

- 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.

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/

Course Code: MCS2043 **Course Name:** Web Technologies
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 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 : MIT2044 **Course Name :** Distributed Systems
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 Content:

Unit 1. 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 2. 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 3. 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 DSM

Unit 4. Synchronization

Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms.

Unit 5. 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

Reference Books:

1. Distributed OS by Pradeep K. Sinha (PHI)

2. Tanenbaum S. : Distributed Operating Systems, Pearson Education

3. Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms. (Pearson Education)

4. George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems concepts and design

Online links for study & reference materials :

https://www.vssut.ac.in/lecture_notes/lecture1423183198.pdf

Course Code: MCS2051 **Course Name: numerical analysis**
Course Credit Hour: 4hr **Total Contact Hour:** 60hr

Course Objective:

- To learn various interpolation and statistical methods

Course outcome :

- Learn the theory and foundations of numerical analysis
- Learn the different process models and choose the best model for their project

Course Description :

- Knowledge of basic NA methods and practices, and their appropriate application.
- Introduction to number system and interpolation

Course Contents :

Unit-I: Unit-I Introduction: Number System and their conversion, Computer Arithmetic, Machine Computation, Errors and their Computation, General error formula, Error in a series approximation. Solution of Algebraic and Transcendental Equation: Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding complex roots, Muller‟s method, Rate of convergence of Bisection methods, Polynomial Equations.

Unit-II Interpolation: Finite Differences, Difference tables Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Stirling‟s, Bessel‟s, Everett‟s formula.

Unit-III Interpolation with unequal intervals: Langrange‟s Interpolation, Newton Divided difference formula, Inverse Interpolation Numerical Integrationand Differentiation: Introduction, Numerical differentiation Numerical Integration: Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Waddle's rule.

Unit-IV Solution of differential Equations: Picard‟s Method, Euler‟s Method, Taylor‟s Method, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring and Stability of solution.

Unit-V Statistical Computation: Frequency distribution, Relative Frequency, Graphs of Frequency Distribution (Line frequency and Histograms), Types of Frequency Curves (Symmetrical Uni-modal Curves, Moderately Asymmetrical Frequency Curves), Control Charts, Acceptance Sampling

Course learning outcome :

- **CLO1 :** Understand basic numerical analysis methods and practices, and their appropriate application.
- **CLO2:** Understand statistical distribution

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.

line links for study & reference materials :
https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf

Course Code: MCS2052 **Course Name:** Microprocessor and assembly language **Course**
Credit Hour: 4hr **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 time; 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: MCS2053 **Course Name:** Natural language processing
Course Credit Hour: 4hr **Total Contact Hour:** 60hr

Course Objective:

- Natural language processing deals with written text. Students will learn how to process written text from basic of fundamental knowledge starts with Finite automata, Regular expression and probabilistic model with n-grams. Recognizing Speech and parsing with grammar. This course also covers basis of semantic analysis and discourse analysis and drives it to machine translation. This NLP course will boost student knowledge to research level where they can conduct new level of research. It really helpful for undergraduate students.

Course Outcome:

- Implement probabilistic and language parsing.(Application)
- Differentiation of semantic and discourse in terms of NLP.(Analyse)

Course Description:

- The subject is very important in forming the basics Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing and study of Scope Ambiguity and Attachment Ambiguity resolution.

Course Contents:

Unit-I:Introduction of NLP: Knowledge in Speech and Language processing,ambiguity and models and algorithm,language and understanding,brief history.

Unit -II: Regular Expressions, Automata, Similarity Computation: Regular Expressions,patterns,FA,Formal Language,NFSA,Regular Language and FSAs, Raw Text Extraction and Tokenization, Extracting Terms from Tokens, Vector Space Representation and Normalization, Similarity Computation in Text

Unit - III: Morphology and Finite-State Transducers: Inflection,Derivational Morphology, Finite-State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with FiniteState Transducers, Combining FST Lexicon and Rules, Lexicon-free FSTs: The Porter Stemmer, Human Morphological Processing

Unit - IV: Matrix Factorization and Topic Modeling: Introduction, Singular Value Decomposition, Nonnegative Matrix Factorization, Probabilistic Latent Semantic Analysis, Latent Dirichlet Allocation .

Unit - V: Computational Phonology and Text-to-Speech: Speech Sounds and Phonetic Transcription, The Phoneme and Phonological Rules, Phonological Rules and Transducers, Advanced Issues in Computational Phonology, Machine Learning of Phonological Rules, Mapping Text to Phones for TTS.

Course learning outcome:

- **CO1.** Understand Natural Language Processing (Understanding).
- **CO2.** Students will be able to understand Probabilistic model of defining language and techniques.(Application)
- **CO3.** Students will be able to learn the .Application of context free grammar and language parsing.(Application)
- **CO4**.Applying Hidden Markov model and Speech Recognition.(Application)

Text books:

1. Daniel Jurafsky and James H.Martin Speech and Language Processing(2nd Edition),Prentice Hall:2 edition,2008.
2. Machine Learning for Text by Charu C.Aggarwal,Springer,2018 edition
3. Foundations of Statistical Natural Language Processing by Christopher D.Manning

Reference Books:

1.Steven Bird,Ewan Klein and Edward Loper Natural Language Processing with Python,O'Reilly Media;1 edition,2009

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Online links for study & reference materials :

- https://blog.algorithmia.com/introduction-natural-language-processingnlp/
- https://www.udacity.com/course/natural-language-processingnanodegree--nd892
- https://www.coursera.org/learn/language-processing

Course Code: MIT2054 **Course Name:** Information Security
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 termsin 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, Criteriafor 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 KeyCryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies.Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, NetworkAttacks, Need of Intrusion Monitoring and Detection, Intrusion Detection.
- **Unit - V** Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types & overview of CyberCrimes, 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, Criteriafor 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

MCS-251: Advance C++ Lab

MCS-255: DSE3 Lab

Course Code: MCS301 **Course Name:** Machine learning using Python Programming
Course Credit Hour: 4hr **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:

1. Yang, "Applied Numerical Methods using MATLAB", Wiley India
2. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH, 1st Edition. Gerald & Whealey, "Applied Numerical Analyses"

Reference books :

1. Grewal B S, "Numerical methods in Engineering and Science", KhannaPublishers, 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 : MCS 302 **Course Name :** Adv. Dot (.) NET Framework

Course Credit Hour : 4hr **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 : MCS303 **Course Name :** Advance Operating system

Course Credit Hour : 4hr **Total Contact Hour :** 60hr

Course Objective :

- To study concepts related to operating systems, like process management, concurrency and control of processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization and implementation. Also to study different methods for protection and security that is becoming vital now-a-days.

Course outcome :

- The students will understand Operating System concepts and design Operating Systems

Course Description :

- To master the basic concepts related to operating systems. To learn in detail about process management.
- To master concurrency and control of processes like critical-section problems and its solution. To understand memory management functions of operating systems.
- To familiar with principles of deadlock and its prevention. To understand the concepts of file system interface.

Course Contents :

Unit – I: Operating system and function, Evolution of operating system, Batch, Interactive, multiprogramming, Time Sharing and Real Time System, multiprocessor system, Distributed system, System protection. Operating System structure, Operating System Services, System Program and calls.

Unit – II: Process concept, State model, and process scheduling, job and process synchronization, structureof process management, Threads interprocess Communication and Synchronization: Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Hardware Synchronization, Critical Regions, Conditional critical region, Monitor, Inter ProcessCommunication. CPU Scheduling: Job scheduling functions, Process scheduling, Scheduling Algorithms, Non Preemptive and preemptive. Strategies, Algorithm Evaluation, Multiprocessor Scheduling.Deadlock: System Deadlock Model, Deadlock Characterization, Methods for handling deadlock, Prevention strategies, avoidance and Detection, Recovery from deadlockcombined approach.

Unit – III: Single Contiguous Allocation: H/W support, S/W support, Advantages and disadvantages, Fragmentation, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Swapping, Overlays

Unit – IV: Principles of I/O hardware, Device controller, Device Drivers, Memory mapped I/O, Direct Access Memory, Interrupts, Interrupt Handlers, Application I/O interface, I/O Scheduling, Buffering, Caching, Spooling, Disk organization, Disk space management, Disk allocation Method, Disk Scheduling, Disk storage.

Unit - V : File Concept, File Organization and Access Mechanism, File Directories, Basic file system, File Sharing,Allocation method, Free space management. Policy Mechanism, Authentication, Internalexcess Authorization.

Course learning outcome :

- **CLO1 :** To master the basic concepts related to operating systems. To learn in detail about process management.
- **CLO2:** : To master concurrency and control of processes like critical-section problems and its solution. To understand memory management functions of operating systems.
- **CLO3**: To familiar with principles of deadlock and its prevention. To understand the concepts of file system interface.
- **CLO4** :To familiar with file system implementation. To understand mass storage management functions of operating systems.
- **CLO5:** To familiar with Protection and security aspects of operating systems. To expose to other operating systems like distributed OS, Multi-processor OS, RTOS and Mobile OS.

Text books :

1. Operating systems concepts , galvin gagne , TATA-Mcgrawhill
2. Operating systems and applications , william stallings

Online links for study & reference materials :

https://www.cse.iitb.ac.in/~mythili/os/

MCS351 :LAB based on Machine learning using Python

MCS352:LAB based on .Net Framework

MCS353: industrial seminar

MCS354 : minor project

Course Code: MCS401 **Course Name:** Advance Database Management system
Course Credit Hour: 4hr **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, Codds Rules.

Unit - II: Data Base Design: Functional Dependency and Decomposition - Functional Dependency - Decomposition. Normalization - Introduction - Normalization - Normal Forms INF, 2NF, 3NF - BCNF - 4 NF - 5 NF.

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.

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Online links for study & reference materials:

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

Course Code : MCS402 **Course Name:** cryptography and network security

Course Credit hour : 4hr **Total Contact Hour :** 60hr

Course Objective :

- To SUMMERIZE different encryption techniques

Course outcome :

- **To** demonstrate cryptographic algorithms for public and private keys

Course Contents :

UNIT I Security trends, Attacks and services, Classical crypto systems, Different types of ciphers Ceaser, Transposition and Hill Cipher, sequences Group, Ring and Field, Congruence's Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's theorem

UNIT II Simple DES, Differential cryptanalysis, DES – Modes of operation – Triple DES – AES – RC4 – RSA – Attacks – Primality test, factoring.

UNIT III Discrete Logarithms, Computing discrete logs, Diffie-Hellman key exchange, ElGamal Public key, cryptosystems: Hash functions, Secure Hash, Birthday attacks -MD5 – Digital signatures – RSA –Elgamel DSA

UNIT IV Authentication applications, Kerberos, X.509, PKI, Electronic Mail security, PGP, S/MIME IP security, Web Security, SSL, TLS, SET

UNIT V System security, Intruders, Malicious software, viruses, Firewalls, Security Standards

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.

References :

1.Godbole," Information Systems Security", Willey

2.Merkov, Breithaupt," Information Security", Pearson Education

Course Code : MCS403 **Course Name:** Entrepreneurship development
Course Credit hour : 4hr **Total Contact Hour :** 60hr

Course Objective :

- To create an understanding in the mind of the student regarding formal and professional communication practiced 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 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.

Course Contents :

Unit-I:(Business Communication) : Difference between general and business communication, this should cover general and technicalwriting, 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 confidense 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 riting, 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/

MCS451 : Advance DBMS lab

MCS 452: Cryptography and network security

Major Project