Minutes of the BOS meeting: M.Sc in Information Technology

School of Basic Sciences, CSJM University, Kanpur

An online meeting of Board of Studies for M.Sc in Information Technology to be started in the School of Basic Sciences was held on 13/05/2022 at 3:00 pm to discuss the syllabus of upcoming course "M.SC in Information Technology" from the academic year 2022-2023 in the School of Basic Sciences. The following members (as approved by the Vice Chancellor, CSJM University) attended the meeting.

1. Prof. Narendra Kohli, Professor & Head, Computer Science & Engineering, HBTU, Kanpur, External member
2. Dr. Pawan Kumar Tewari, Assistant Professor, Computer Science & Engineering, IET, Lucknow , External member
3. Prof. R.K. Dwivedi, Director, School of Basic Sciences CSJM University Kanpur
4. Dr. Rashi Agarwal, Head, Department of Information Technology, UIET, CSJM University Kanpur
5. Dr. Alok Kumar, Department of Computer Science & Engineering, UIET, CSJM University Kanpur
6. Dr. Anju Dixit, Deputy Director, School of Basic Sciences CSJM University Kanpur

The syllabus was discussed in detail. Some major corrections were suggested which have been incorporated accordingly. BOS recommends the enclosed syllabus to be implemented for in M.SC Information Technology Course.

Prof. Narendra Kohli
Professor & Head
Computer Science & Engineering Department
HBTU, Kanpur.

Dr. Pawan Kumar Tewari
Assistant Professor
Computer Science & Engineering Department
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Prof. R.K. Dwivedi
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Dr. Anju Dixit
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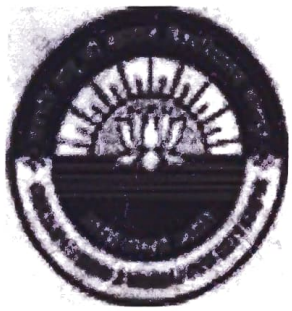
Proposed Syllabus
M.Sc. Information Technology



School of Basic Sciences
CSJM, University
Kanpur

Proposed NEP Programme Structure for M.Sc. IT

Total Marks : 2200
Total Credits : 100

First Year				Second Year			
I[st] Semester		2[nd] Semester		3[rd] Semester		4[th] Semester	
Paper/Type	Credit	Paper/Type	Credit	Paper/Type	Credit	Paper/Type	Credit
Unix and C Programming **Core**	4	Data Structure using C **Core**	4	Introduction to PYTHON **Core**	4	Probability and Statistics for Computer Science **Core**	5
Computer Organization **Core**	4	Computer Networks **Core**	4	Design and Analysis of Algorithms **Core**	4	Artificial Intelligence **Core**	5
Operating System **Core**	4	Theory of Computation **Core**	4	Data Mining **Core**	4	Computer Vision and Image Recognition **Core**	5
Discrete Mathematics **Core**	4	Elective-1	4	Elective-2	4	Elective- 3	5
Lab Unix and C Programming) **Core**	4	Data Structure Lab **Core**	4	PYTHON Lab **Core**	4	-	-
Research Project	-	Research Project	8	Research Project	-	Research Project	8
Total credits	20		28		20		28
Minor elective from other department faculty to be taken in I[st] year only(I[st] or II[nd] semester)							
Minimum credits annually	**52**			**48**			

***Research Project will be evaluated in the second and fourth semester.**

First Semester Total Marks: 500

Subject Code	Subject Title	Core/Elective	Credits
MIT101	Unix and C Programming	Core	4
MIT102	Computer Organization	Core	4
MIT103	Operating System	Core	4
MIT104	Discrete Mathematics	Core	4
MIT105	Lab Unix and C Programming)	Core	4
MIT106	**Research Project**	-	-
	Total		20

Total Marks: 700

Second Semester

SubjectCode	SubjectTitle	Core/Elective	Credits
MIT201	Data Structure using C	Core	4
MIT202	Computer Networks	Core	4
MIT203	Theory of computation	Core	4
MIT204 /MIT205/MIT206	Elective-1	Elective	4
MIT207	Data Structure Lab	Core	4
MIT208	**Research Project**	-	8
	Total		28

***List of Elective-1**

MIT204- Database Management Systems (DBMS)
MIT205- Software Engineering
MIT206- Numerical Computing

Total Marks: 500

Third Semester

Subject Code	Subject Title	Core/Elective	Credits
MIT301	Introduction to PYTHON	Core	4
MIT302	Design and Analysis of Algorithms	Core	4
MIT303	Data Mining	Core	4
MIT304/MIT 305/MIT306	Elective-2	Elective	4
MIT307	PYTHON Lab	Core	4
MIT308	**Research Project**	-	-
	Total		20

***List of Elective-2-**

MIT304-Wireless Sensor Networks
MIT305-Network Security
MIT306- Information Retrieval

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Total Marks: 500

Fourth Semester

Subject Code	Subject Title	Core/Elective	Credits
MIT401	Probability and Statistics for Computer Science	Core	5
MIT402	Artificial Intelligence	Core	5
MIT403	Computer Vision and Image Recognition	Core	5
MIT404/MIT 405/MIT406	Elective- 3	Elective	5
MIT407	**Research Project**	-	**8**
	Total		**28**

***List of Elective-3**

MIT404- Machine Learning
MIT405-DEEP LEARNING
MIT406 -Internet of Things

Course Code: MIT-101 **Breakup: 4 – 0 – 0**
Course Name: Unix and C Programming
Course Details:

Unit I	The Free Software Movement, Open-source definition, Open-source business strategy, Problem Solving and its tools, Flow chart, Pseudo code, Modular programming. Fundamentals of Unix Operating System, Login & Password, Different Commands, Unix directory, Structure and working with directories, Vi-editor, Basic Structure and execution of C programs, Constants, Variables, and Data Types and various type of declarations, Different type operators and Expressions, Evaluation of Expressions, Operator Precedence and Associability, Mathematical Functions.
Unit II	Managing Input and Output operations, Decision Making and Branching, Decision Making and Looping. One – dimensional Arrays and their declaration and Initializations, Two-dimensional Arrays and their initializations, Multidimensional Arrays, String Variables, Reading and Writing Strings, Arithmetic Operations on characters, Putting Strings together, Comparison of Two Strings, String – handling functions.
Unit III	Need and Elements for user –defined Functions, Definition of Functions, Return values and their types, Function calls and Declaration, Arguments and corresponding return values, Functions that return multiple values, Nesting of functions, Recursion, Passing arrays and strings to functions, The Scope, Visibility and Life time of variables.
Unit IV	Defining Structure, Declaring Structure Variable and Accessing Structure Members, Initialization of Structure, Comparing Structure Variables, Operation on Individual Members, Arrays of Structures, Structures within structures, Structures and Functions, Unions, Size of Structures, Bit Fields.
Unit V	Pointers to Functions, Pointers and Structures, File Management in C. use of fopen(), fclose(),Formatted file I/O, Searching through files using fseek(), ftell(), rewind().

Textbooks and References:

1. Kernighan K. R., Ritchie D. M. - The C Programming Language, Ansi C Edition, Prentice Hall, India
2. E. Balagurusamy – Programming in ANSI C, 3rd Edn. , TMH, New Delhi ;2004
3. N. Kanthane – Programming with ANSI and TURBO C, Pearson Education, New Delhi; 2004
4. Y. Kanetkar – Let us C, 4th Edition, BPB Publication , New Delhi;2002

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Course Code: MIT-102 **Breakup: 4 – 0 – 0**
Course Name: Computer Organization
Course Details:

Unit I	Brief review of digital logic, Boolean algebra, flip flops, etc. Data Representation: Integer representation-- number systems (binary, octal, Decimal, Hexadecimal), 1's and 2's Complements, Floating point numbers - - IE standard, normalization.
Unit II	Computer Arithmetic: Half adder, Full adder, ripple carry and carry look-ahead adders, Multipliers Booth's algorithm. Processor Organization, Registers, Instruction cycle, ALU design, Instruction set of a processor, types of operands, types of operations, addressing modes, instruction formats.
Unit III	Memory: RAM, ROM, DRAM Vs SRAM, Organization of memory cells inside a memory chip, Interfacing of memory with processor; Cache memory - mapping function emplacement algorithm, Write policy.
Unit IV	Input Output Organization: Program controlled, Interrupt driven (priority interrupts Daisy chaining), Direct memory access. Control Unit: Micro–operations - - hardwired implementation, Microprogramming.
Unit V	Computer Peripheral Organization: Keyboard, Monitor, Hard disk, CD-ROMs, Printers, etc.

Textbooks and References:

1. V.C. Hamacher, Z.G. Vranesic and S.G.Zaky, Computer Organization, Fourth Edition, McGraw Hill, 1996. Patterson, Computer Organization & Design.
2. Stalling – Computer Organization & Architecture PHI
3. David A Paterson and John L. hennery – Computer Organization & Design Harcourt Asia.
4. Morris Meno – Computer System & Architecture (TMH)
5. Pal Chaudhari- Computer Organization & Design (PHI)

Course Code: MIT-103 **Breakup:** **4 – 0 – 0**
Course Name: Operating System
Course Details:

Unit I	Introduction and history of operating system Process Management: Process Synchronization and mutual exclusion, Two process solution and Dekker's algorithm, semaphores monitors, Examples (Producer – consumer, reader- writer, dining philosophers, etc.)
Unit II	CPU Scheduling: Multiprogramming and time sharing, Scheduling approaches (shortest–job–first, first–in–first–out, Round Robin, etc.)
Unit III	Deadlock: Modeling, detection and recovery, prevention and avoidance. Interprocess communication: Shared memory, message passing pipes.
Unit IV	Input/ output: Devices controllers and device drivers, disk scheduling, other devices Memory Management: with and without swapping, virtual memory- paging and segmentation, pagereplacement algorithm, Implementation.
Unit V	File System: FS services, Disk source management, Directory and data structure Security, Protection, Access right.

Textbooks and References:

1. A.Silberschatz and P.B. Galvin, Operating system concepts, Addition Wesley, Fourth edition, 1994. (reprinted 1995)
2. Harris Schaum's outline operating System TMH
3. Tanenbaum – Advanced operating System
4. Milan Milankovic – Operating System
5. stallings – Operating System
6. Crowley – Operating system design.

Course Code: MIT-104
Course Name: Discrete Mathematics
Course Details:

Breakup: **4 – 0 – 0**

Unit I	Sets, Relations & Functions: Property of binary relations, equivalence, compatibility, partial ordering relations, Hasse diagram, functions, inverse functions, composition of functions, recursive functions.
Unit II	Mathematical Logic: Logic operators, Truth tables, Theory of inference and deduction, mathematical calculus, predicate calculus, predicates and quantifiers.
Unit III	Boolean Algebra: Truth values and truth tables, the algebra of propositional functions, Boolean algebra of truth values.
Unit IV	Combinatorics & Recurrence Relations: Permutation, Combination, Principle of Inclusion and Exclusion, Recurrence Relations, Generating Functions.
Unit V	Graph theory: Basic Concepts of Graphs and Trees, Adjacency and Incidence Matrices, Spanning Tree, Transitive Closure, Shortest Path, Planar Graphs, Graph Coloring, Eularian and Hamiltonian graphs, Applications of Graph Theoretic Concepts to Computer Science Introduction to Grammar and Languages, Regular Expression, Machines Recognizing languages: Finite State Automata: Deterministic and non-deterministic.

Text Book and References:

1. J. P. Trembley and R. P. Manohar, Discrete Mathematical Structures withApplications to Computer Science, McGraw Hill.
2. N. Deo, Graph Theory with Applications to Engineering and Computer Science, PHI.
3. C. L. Liu, Elements of Discrete Mathematics, McGraw-Hill.
4. K. Rosen, Discrete Mathematics, Tata McGraw Hill.
5. K. L. P. Mishra, N. Chandrasekaran, Theory of Computer Science: Automata,Languages and Computation, PHI.

Course Code: MIT-105 **Breakup: 0 – 0 – 4**

Course Name: Lab Unix and C Programming

Course Details:

C programs

1. Write a C program to display "This is my first C Program".
2. Write a C program to add two numbers (2 and 6) and display its sum.
3. Write a C program to multiply two numbers (4 and 5) and display its product.
4. Write a C program to calculate area and circumference of a circle.
5. Write a C program to perform addition, subtraction, division and multiplication of two numbers.
6. Write a program to calculate simple and compound interest.
7. Write a program to swap values of two variables with and without using third variable.
8. Write a program to display the size of every data type using "sizeof" operator.
9. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
10. Write a program to input two numbers and display the maximum number.
11. Write a program to find the largest of three numbers using ternary operators.
12. Write a program to find the roots of quadratic equation.
13. Write a program to input name, marks of 5 subjects of a student and display the name of the student, the total marks scored, percentage scored and the class of result.
14. Write a Program to Search an element in array.
15. Write a Program to perform addition of all elements in Array.
16. Write a Program to find the largest and smallest element in Array.
17. Write a Program to reverse the array elements in C Programming.
18. Write a Program for deletion of an element from the specified location from Array.
19. Write a Program to access an element in 2-D Array.
20. Write a program for addition of two matrices of any order in C.
21. Write a Program to multiply two 3 X 3 Matrices.
22. Write a program to read a string and check for palindrome without using string related function (a string is palindrome if its half is mirror by itself eg: abcdcba).
23. Write a program to accept a string and count the number of vowels present in this string.

Course Code: **MIT-201** **Breakup:** **4 – 0 – 0**
Course Name: **Data Structure using C**
Course Details:

Unit I	Basic concepts and notations, Mathematical background, Revision of arrays and pointers, Recursion and implementation of Recursion
Unit II	Stacks and Queues : Sequential representation of stacks and queues Lists: List representation techniques, Dynamics Storage allocation, Representation of stacks and queues using linked list, operations on linked list, Introduction to Doubly linked list.
Unit III	Sorting Algorithms: Insertion sort, Bubble sort, Quick sort, Merge sort, Heap sort, Shell sort, Time and Space complexity of sorting algorithms Tables: Searching sequential tables, Index sequential searching, Hash tables, Heaps.
Unit IV	Trees: Definition and basic concepts, Linked tree representations, Binary tree traversal algorithms,(Preorder, Inorder, Postorder), Binary search tree, Insertion and Deletion in Binary search tree, Multiway search trees, B trees, B+ tree and their applications, Digital search trees and Trie structure.
Unit V	Graphs: Introduction to Graphs, Implementation of Graphs, Depth first search, Breadth first search. Introduction to External Sorting

Text Books and References:

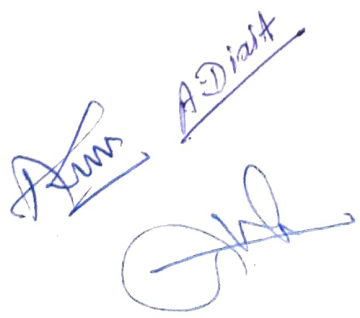
1. Y. Langsam, M.J. Augenstein and A.M. Tenenbaum, Data Structure Using C and C++. Second Edition, Prentice Hall of India, 1997.
2. John R. Husband – Schaum outline Data structure with C++, McGraw Hill
3. Lafore – Data structure & Algorithms in java, (BPB Publication)
4. Sartaj Sahni – Data structure, Algorithms & application in C++ (McGraw Hill)

Course Code: MIT-202 **Breakup:** 4 – 0 – 0
Course Name: Computer Networks
Course Details:

Unit I	Introduction: History and development of computer networks, Local area networks, Metropolitan area networks, wide area networks, networks topologyISO/OSI seven layer architecture, connectionless versus connection oriented.
Unit II	Data Communication: Data encoding and transmission, data link control, Multiplexing, packetswitching, LAN Architecture, LAN Systems (Ethernet, Token Ring), Network devices switches,Gateways, Routers
Unit III	Physical Layer: transmission media, analog transmission, digital transmission. Data link layer: framing error detection and correction, stop-and wait protocol, sliding window protocols, HSLC protocol. MAC Layer: Aloha protocols, CSMA/CD: Ethernet, token ring, token bus Logical link control, Bridges and switches, FDDI, fast Ethernet, FDM, TDM.
Unit IV	Network layer: Virtual circuit, datagrams, Routing Algorithms shortest path, distance vector, link state routing, flooding, hierarchical routing, congestion control algorithms. Internetworking tunneling, Encapsulation, Fragmentation. Multicasting, Inter network protocols (IP) – header structure, addresses, option, etc. Routing protocols, (Example: RIP, HELLO, OSPF, BGP)classless Inter- domain routi9ng other protocols, ICMP,ARP, RARP,BOOTP,DHCP.
Unit V	Asynchronous Transfer mode (ATM); cell format, connection setup, switching, quality –of –services, ATM adaptation layers.

Text Book and References:

1. A.S. Tannenbaum, Computer network, Third Edition, PHI 1996.
2. Shillings– Data Communication and Networks.
3. Behrouz A. Foreran – Data Communication and Networks. (TMH)
4. Black – Computer Network (PHI)
5. Nance – Network Programming in C (PHI)



Course Code: MIT-203 **Breakup:** 4 – 0 – 0
Course Name: Theory of Computation
Course Details:

Unit I	**Formal Language and Grammar**: Production systems, Chomsky Hierarchy, Right linear grammar and Finite state automata, Context free grammars, Normal forms, Derivation trees and ambiguity.
Unit II	**Finite state Automata**: Non deterministic and deterministic FSA, NFSA with ε-moves, Regular Expressions, Equivalence of regular expression and FSA, Pumping lemma, closure properties and decidability, Myhill - Nerode theorem and minimization, Finite automata with output.
Unit III	**Pushdown automata**: Acceptance by empty store and final state, Equivalence between pushdown automata and context-free grammars, Closure properties of CFL, Deterministic pushdown automata.
Unit IV	**Turing Machines**: Techniques for Turing machine construction, Generalized and restricted versions equivalent to the basic model, Godel numbering, Universal Turing Machine, Recursively enumerable sets and recursive sets, Computable functions, time space complexity measures, context sensitive languages and linear bound automata.
Unit V	**Decidability**: Post's correspondence problem, Rice's theorem, decidability of membership, emptiness and equivalence problems of languages.

Text Book and References:

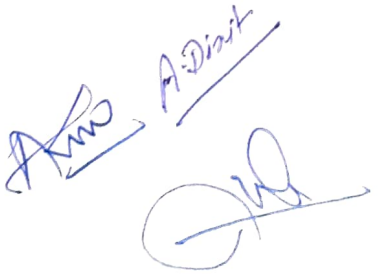
1. J. E. Hopcraft, R. Motwani, J. D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson.
2. H. R. Lewis, C. H. Papadimitrou, Elements of the Theory of Computation, PHI.
3. P. Linz, An Introduction to Formal Language and Automata, Narosa Publisher.
4. K. L. P. Mishra, N. Chandrasekaran, Theory of Computer Science: Automata,Languages and Computation, PHI.

Course Code: MIT-204 **Breakup:** **4– 0 –0**
Course Name: Database Management Systems, DBMS
Course Details:

Unit I	**Introduction**: Database Systems, View of Data Models, Database Languages, DBMSArchitecture, Database Users and Data Independence.
Unit II	**ER Modeling**: relation types, role and Structural Constraints, Extended ER ModelingFeatures, Design of an ER Database Schema, Reduction of ER Schema to Tables. **Relational Model**: Relational Model Concepts, Relational Algebra.
Unit III	**Introduction to SQL:** SQL data types and literals, Types of SQL commands, SQL operators,Tables, views and indexes, Queries and sub queries, Aggregate functions.
Unit IV	**Relational Database Design**: Functional and multi-valued Dependencies, DesirableProperties of Decomposition, Normalization up to 3 NF and BCNF.
Unit V	**Selected Database Issues**: Security, Transaction Management, Introduction to QueryProcessing and Query Optimization, Concurrency Control, and Recovery Techniques.

Text Book and References:

1. C. J. Date, An Introduction to Database Systems, Vol I & II, Addison Wesley.
2. A. Silberschatz, H. F. Korth, S. Sudarshan, Data Base System Concepts, McGraw Hill.
3. J. D. Ullman, Principles of Database Systems, Galgotia.
4. R. Elmasri, S. B. Navathe, Fundamentals of Database Systems, Pearson Education Asia.
5. R. Ramakrishnan, Database Management Systems, McGraw-Hill Education.



Course Code: MIT-205 **Breakup:** **4–0–0**
Course Name: Software Engineering
Course Details:

Unit I	**Introduction to Software Engineering**: Definition, Software development and life-cyclemodels, CMM, Software Quality, role of metrics and measurement.
Unit II	**Requirements Analysis and Specification**: SRS Building Process,Specification Languages, Validation of SRS, metrics, monitoring and control, Object Oriented analysis.
Unit III	**Software Project Planning**: Software Cost Estimation Techniques, Project Scheduling &Tracking, Project Team Standards, software configuration management. **Software Architecture:** Role of Software Architecture, Architecture Views, Component andConnector View, Architecture Styles for C&C View, Architecture Evaluation
Unit IV	**Design and Implementation**: Design Concepts and Notations, Functional & Object OrientedDesign Concepts, Design Strategies, Design specification and verification, Metrics, Design Translation Process.
Unit V	**Software Testing and Reliability**: Strategies & Techniques, Debugging, Software Maintenance, Software Reliability and Availability Models, Software Reengineering, Cleanroom Approach, Software Reuse. Introduction to IEEE Standards, Case Studies.

Textbooks and References:

1. P. Jalote, An Integrated Approach to Software Engineering, IIIrd Edition, Narosa Publishing House.
2. R. S. Pressman, Software Engineering: A Practitioner's approach, McGraw-Hill. Sommerville, Software Engineering: Pearson Education.
3. C. Ghezzi, M. Jazayeri, D. Mandrioli, Fundamentals of Software Engineering, PHI.
4. R. Mall, Fundamentals of Software Engineering, PHI.

Course Code: MIT-206 **Breakup: 4 – 0 – 0**
Course Name: Numerical Computing
Course Details:

Unit I	Errors in Computer Arithmetic, Normalization. Bisection, False position and Newton-Raphson methods for solution of nonlinear equations. Errors in the solutions, Convergence of Solutions.
Unit II	Gauss, Gauss-Siedel and Iterative methods for system of linear equations. Ill conditioned system, Pivotal Condensation, Matrix Inversion, Eigen-values, Eigen-vector, Diagonalization of Real Symmetric Matrix by Jacobi's Method.
Unit III	Introduction to Finite Differences. Polynomial Interpolation using Newton's and Lagrange's formulae
Unit IV	Numerical Differentiation: Numerical Integration: Trapezoidal Rule, Simpson's Rule, Weddle's Rule, Gauss Quadrature Formula. Error in numerical Integration.
Unit V	Numerical Solution of differential Equations: Picards Method, Taylor's Series Method, Euler's Method, Modified Euler's Method, Runge-Kutta Method, Predictor-Corrector Method.

Text Book and References:

1. V. Rajaraman, Computer Oriented Numerical Methods, PHI.
2. F. Acton, Numerical Methods that Work, Harper and Row.
3. S. D. Conte and C.D.Boor, Elementary Numerical Analysis, McGraw Hill.
4. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI.
5. C. F. Gerald and P.O. Wheatley, Applied Numerical Analysis, Addison Wesley

Course code: MIT-207 **Breakup: 0 – 0 – 4**
Course Name: Lab Data Structure using C
Course Detail:

Write Program in C for following:

1. Array implementation of Stack, Queue, Circular Queue
2. Linked list implementation using Dynamic memory Allocation, deletions and insertions, Linked Implementation of Stack, Queue, Circular Queue
3. Implementation of Tree Structures, Binary Tree, Tree Traversals, Binary Search Tree, Insertion and Deletion in BST, Simple implementation of Multiway search trees
4. Implementation of Searching and Sorting Algorithms
5. Graph Implementation, BFS, DFS.

Course Code: MIT - 301 **Breakup:** 4 – 0 – 0
Course Name: Introduction to PYTHON
Course Details:

Unit I	Introduction The Programming Cycle for Python, Python IDE, Interacting with Python Programs, Elements of Python, Type Conversion. Basics: Expressions, Assignment Statement, Arithmetic Operators, Operator Precedence, Boolean Expression.
Unit II	Conditionals and Loops Conditional statement in Python: if-else statement, its working and execution, Nested-if statement and Elif statement in Python, Expression Evaluation & Float Representation, Loops: Purpose and working of loops, while loop including its working, For Loop, Nested Loops, Break and Continue.
Unit III	Strings and Functions Strings: Length of the string, Concatenation and Repeat operations, Indexing and Slicing of Strings. Python Data Structure: Tuples, Unpacking Sequences, Lists, Mutable Sequences, List Comprehension, Sets, Dictionaries, Functions: Partsof a Function, Execution of a Function, Keyword and Default Arguments, Scope Rules, Higher Order Functions: Treat functions as first class Objects, Lambda Expressions.
Unit IV	Classes and Files Generate prime numbers with the help of Sieve of Eratosthenes algorithm, File I/O: File input and output operations in Python Programming Exceptions and Assertions Modules: Introduction, Importing Modules, Abstract Data Types: Abstract data types and ADT interface in Python Programming, Classes: Definition and operations in the classes, Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.), Class Example, Inheritance, Inheritance and OOP.
Unit V	Iterators & Recursion Recursive Fibonacci, Tower of Hanoi, Search: Simple Search, Binary Search, Estimating Search Time in Simple Search and Binary Search, Sorting & Merging: Selection Sort, Merge List, Merge Sort, Higher Order Sort.

Textbooks and References:

1. Allen B. Downey, :Think Python: How to Think Like a Computer Scientist
2nd edition, Updated for Python 3, Shroff/O„Reilly Publishers, 2016,
(http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, —Introduction to Computation and Programming Using Python„„„ Revised and expanded Edition, MIT Press, 2013.
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016

Course Code: MIT-302 **Breakup:** **4 – 0 –0**

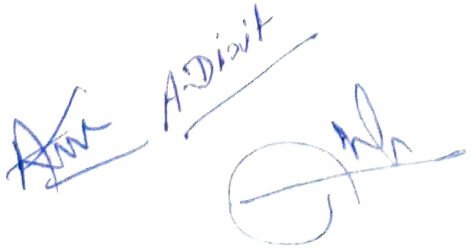
Course Name: **Design and Analysis of Algorithms**

Course Details:

Unit I	Notion of algorithm, Big Oh, Small–oh, Theta and Omega notations, Space and Timecomplexities of an algorithm **Sorting and Order Statistics:** Revision of complexity analysis of different sorting algorithmsand introduction to recurrence relations
Unit II	**Introduction:** A first problem: Stable matching **Graph Algorithms:** Breadth First search, Depth First search, single source shortest paths,minimum spanning trees, all pair shortest paths, Traveling sales person problem
Unit III	**Fundamental design paradigms:** **Divide and Conquer**: Mergesort, Binary search, Quick sort, Matrix multiplication **Greedy methods**: Shortest path algorithms, fractional knapsack problem, task schedulingproblem,etc
Unit IV	**Dynamic Programming**: 0/1 knapsack problem, longest common subsequence, Matrix chainmultiplication, etc **Network Flow**: The maximum flow problem and Ford Fulkerson algorithm, maximum flowsand minimum cuts in a network
Unit V	**Theory of NP completeness:** Polynomial time, NP complete problems, concept of reducibility. **Measure of approximation:** ratio bound and relative error, Polynomial time approximationscheme.

Textbooks and References:

1. E. Horowitz and S. Sahni, Fundamentals of Computer Algorithms, Galgotia, 1991
2. Jon Kleinberg and Eva Tardos, Algorithm Design
3. Charles. E. Ronald – Introduction to Algorithms (PHI)
4. Thomas H. Corman, Charles E. Uisenton Ronald L. Rivest. Introduction to Algorithms.
5. Sara Baase & Gelder – Computer Algorithms (Pearson)
6. Aho, Hoperoft, Wilman – Design & Analysis of Computer

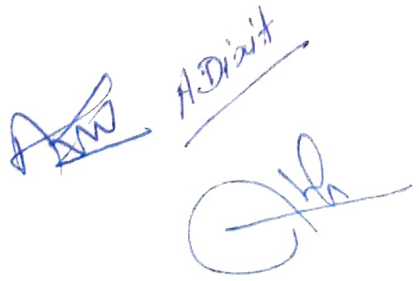


Course Code: MIT-303 **Breakup:** **4 – 0 –0**
Course Name: **Data Mining**
Course Details:

Unit I	**Introduction**: The idea of Data Mining, Data Mining Functionalities, Association Analysis, Classification and Prediction, Cluster Analysis, Outlier Analysis, Major issues in Data Mining, KDD process, Difference between Data Mining, Data Warehouse, OLAP and DBMS.
Unit II	**Data Preprocessing**: Data cleaning, Data Integration and Transformation, Data Reduction. Architectures of Data Mining Systems.
Unit III	**Mining Association Rules in Large Databases**: Association Rule Mining, Mining Single- Dimensional Boolean Association Rules from Transactional Database, Mining multilevel association rules from transaction databases, constraint based association mining.
Unit IV	**Classification, Prediction and Cluster Analysis**: Issues, Classification by Decision Tree induction, Prediction, Cluster Analysis- types of data in cluster analysis, Partitioning.
Unit V	**Mining complex Types of Data:** Spatial Databases, Multimedia Databases, Time-series andsequence data, Text databases, WWW. **Applications and Trends in Data Mining**: Application, SocialImpacts.

Textbooks and References:

1. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Academic Press.
2. I. H. Witten et al., Data Mining: Practical machine Learning Tools and Techniques, Morgan Kaufmann Publisher.
3. A. Rajaraman and J. Ullman, Mining of massive datasets, CUP.



Course Code: MIT-304 **Breakup:** **4 – 0 –0**
Course Name: **Wireless Sensor Networks**
Course Details:

Unit I	**Introduction and Overview of Wireless Sensor Networks**: Background of Sensor Network, Characteristics, Challenges and Constraints, Applications of WSN, Node Architecture, Operating Systems, Layered Architecture, Sensor network comparison with Ad Hoc Networks.
Unit II	**Medium Access Control**: Overview, Wireless MAC Protocols, Characteristics of MAC Protocols in WSN, Objectives of MAC design, Energy efficiency in MAC design, Contention - free MAC Protocols, Contention-based MAC Protocols, Hybrid Protocols.
Unit III	**Routing and Transport issues**: Overview, Fundamentals and Challenges of Routing protocol, Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS based Routing, Data aggregation mechanisms. Traditional transport protocols, Transport protocols for sensor networks.
Unit IV	**Deployment and Configuration**: Clustering Techniques in WSN: Topology discovery and clusters in WSN, Node Clustering structures, Node Clustering algorithms. Localization and Positioning, Single-hop Localization, Positioning in Multi-hop environments, Coverage and Connectivity, Naming and Addressing in Sensor Networks, Assignment of MAC addresses.
Unit V	**Future Trends in WSN**: Wireless Multimedia Sensor Networks, Underwater Acoustic Sensor Networks, Underground Sensor Networks, Body Area Sensor Network, Cross -LayerDesign for WSN.

Textbooks and References:

1. H. Karl, A. Willig, Protocols and Architectures for Wireless Sensor Networks, John Wiley & Sons, India, 2012.
2. W. Dargie, C.Poellabauer, Fundamentals of Wireless Sensor Networks Theory and Practice, John Wiley and Sons , 2010.
3. S. Kazem, D. Minoli, T. Zanti, Wireless Sensor Network: Technology, Protocols and Application, John Wiley and Sons 1st Ed., 2007.

Course Code: MIT-305
Course Name: Network Security **Breakup: 4 – 0 –0**
Course Details:

Unit I	**Introduction**: Computer Security Concepts, The OSI Security Architecture, Security Attacks,Security Services, Security Mechanisms, A Model for Network Security.
Unit II	**Symmetric Encryption and Message Confidentiality**: Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes ofOperation.
Unit III	**Cryptography and Message Authentication**: Approaches to Message Authentication, SecureHash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public- Key Cryptography Algorithms, Digital Signatures.
Unit IV	**Key Distribution and User Authentication**: Symmetric Key Distribution Using SymmetricEncryption, Kerberos, Key Distribution Using Asymmetric Encryption, X.509 Certificates.
Unit V	**Transport-Level Security**: Web Security Considerations, Secure Socket Layer and TransportLayer Security, HTTPS, Secure Shell (SSH). **IP Security**: Overview of IP Security (IPSec), IP Security Architecture, Modes of Operation,Security Associations (SA), Authentication Header (AH), Encapsulating Security Payload(ESP), Internet Key Exchange. **Web Security**: Web Security Requirements, Secure Socket Layer (SSL), Transport LayerSecurity (TLS), Secure Electronic Transaction (SET). **Electronic Mail Security**: Threats to E-Mail, Requirements and Solutions, Encryption forSecure E-Mail, Secure E-Mail System.

Textbooks and References:

1.W. Stalling, Network security, essentials, Pearson education Asia publication.
2.W. Stallings, Cryptography and Network Security: Principles and Practice, Pearson.
3. B. A. Forouzan, Cryptography and Network Security, McGraw-Hill Education.

Course Code: MIT-306 **Breakup:** **4 – 0 –0**
Course Name: **Information Retrieval**
Course Details:

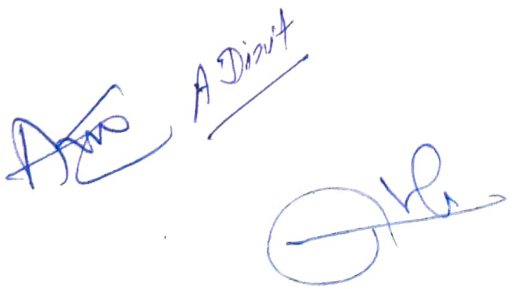
Unit I	**Introduction:** Information, Information Need and Relevance; The IR System; Early developments in IR, User Interfaces.
Unit II	**Retrieval Evaluation:** Notion of Precision and Recall; Precision-Recall Curve, Standard Performance Measures such as MAP, Reciprocal ranks, F-measure, NDCG, Rank Correlation, Standard Data sets.
Unit III	**Retrieval and IR Models:** Boolean Retrieval; Term Vocabulary and Postings list; Ranked retrieval; Inverted Index, Index Construction; Index compression.
Unit IV	**Document Processing:** Representation; Vector Space Model; Feature Selection; Stop Words; Stemming; Notion of Document Similarity.
Unit V	**Link Analysis**: Page Rank, HITs, Web Crawling.

Textbooks and References:

1. R. Baeza-Yaets, B. Ribeiro-Neto, Modern Information Retrieval: The Concept and Technology behind Search, 2nd Edition, Addison-Wesley.
2. C. D. Manning, P. Raghvan, H. Schutze, Introduction to Information Retrieval, Cambridge University Press.
3. D. A. Grossman, O. Frieder, Information Retrieval: Algorithms and Heuristics, 2nd Ed., Springer.
4. S. Buettcher, Charles L.A. Clarke, G. V. Carmack, Information Retrieval: Implementing and Evaluating Search Engines, MIT Press.
5. B. Croft, D. Metzler, T. Strohman, Search Engines: Information Retrieval in Practice, Addison Wesley

Course Code: MIT - 307 **Breakup:** 0 – 0 – 4
Course name: PYTHON Lab
Course Details

1. WRITE A PYTHON PROGRAM TO FIND GCD
2. WRITE A PYTHON PROGRAM TO CHECK PRIME OR NOT
3. WRITE A PYTHON PROGRAM TO USE POWER FUNCTION
4. WRITE A PYTHON PROGRAM TO CALCULATE BINARY OF A NUMBER
5. WRITE A PYTHON PROGRAM TO CALCULATE HEXADECIMAL OF A NUMBER
6. WRITE A PYTHON PROGRAM TO CALCULATE THE MATRIX MULTIPLICATION
7. WRITE A PYTHON PROGRAM TO FIND THE GREATEST NUMBER IN NUMPY ARRAY
8. WRITE A PYTHON PROGRAM USING LOOPS FOR BUBBLE SORT
9. WRITE A PYTHON PROGRAM TO FIND NAMES OF STUDENTS HAVING NAME LENGTH GREATER THAN 4
10. WRITE A PROGRAM TO FIND NUMBER OF CAPITAL LETTERS
11. WRITE A PYTHON PROGRAM TO REVERSE A STRING
12. WRITE A PROGRAM TO MULTIPLY TWO ARRAYS
13. DEFINE A FUNCTION EXAMPLE IN PYTHON
14. WRITE A PROGRAM TO REMOVE SPACES BETWEEN WORDS
15. FIND THE DATE BIRTH YEAR
16. WRITE A PROGRAM TO REMOVE SPACES AND INSERT THE SPACES WITH "-"
17. WRITE A PROGRAM TO REMOVE DIGITS FROM THE STRING
18. WRITE A PROGRAM TO INSERT THE VALUE OF LIST INTO ARRAY



Course Code: MIT-401 **Breakup:** **4 – 0 – 0**

Course Name: Probability and Statistics for Computer Science

Course Details:

Unit I	Introduction: Data Collection and Descriptive Statistics, Inferential Statistics and probability Models, Population and Samples.
Unit II	Descriptive Statistics: Describing Datasets, Single Point Summarization, Paired Datasets.
Unit III	Probability: Sample Space and Events, Axioms of Probability, Conditional Probability.
Unit IV	Random Variables and Expectations: Random variables, Jointly Distributed Random variables, Expectation, Variance, Co-variance, Probability Distributions. Parameter Estimation-Maximum Likelihood Estimates; Regression Analysis; Applications, Markov Process, Poisson Process.
Unit V	Statistical hypothesis, Null and Alternate hypothesis, test of hypothesis and significance, Type I and Type II errors, Level of Sig-nificance, Tests involving the Normal distribution, One-Tailed and Two-Tailed tests, P value. Special tests of significance for Large samples and Small samples (F, chi- square, z, t- test), ANOVA.

Textbooks and References:

1. S. M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier.
2. W. Feller, An Introduction to probability Theory and its Applications- Vol. 1, Wiley.
3. K. S. Trivedi, Probability and Statistics with Reliability, Queuing and Computer Science Applications, Wiley.

Course Code: MIT - 402 **Breakup:** 4– 0 – 0
Course Name: Artificial Intelligence
Course Details:

Unit I	**Introduction:** Introduction to AI, Foundations of AI, History of AI, Concept of AI techniques, the underlying assumptions, the state of art **Intelligent agents:** Agents and Behavior, The concept of rationality, Agent Architecture
Unit II	**Problem solving:** Problems, problem space and search – Formulating problems, Designing the problems as state space search, Issues in the design of search programs **Uninformed Search Techniques**: Breadth first, Depth first, Depth limited, Iterative deepening, bidirectional, etc
Unit III	**Heuristic/Informed Search Techniques**: Generate and test, Best first search, A* search, Memory bounded heuristic search, Hill climbing search, Simulated annealing search, local beam search, genetic algorithms
Unit IV	**Constraint Satisfaction Problem, Means End Analysis Adversial Search:** Optimal decitions in games, Minmax algorithm, Alpha Beta Pruning **Knowledge Representation** – knowledge representation issues, the predicate calculus representing knowledge using rules, symbolic reasoning, uncertainty, Probabilistic reasoning.
Unit V	**Languages and programming technique for AI**: An Introduction to PROLOG or LISP

Text Books and References:

1. S.J. Russell and P. Norvig , Artificial intelligence : A Modern Approach , PHI
2. Elaine Rich and Kaven Knight – Artificial Intelligence 2nd Ed. TMH
3. Nils J. Nilsson – Artificial Intelligence (Harcourt India Pub.Ltd.)
4. Charnick Mc Dermott – Introduction to Artificial Intelligence (Pearson)
5. Turban Aronson – Decision Support System & Intelligent System (Pearson)

Course Code: MIT - 403 Breakup: 4– 0 – 0
Course Name: Computer Vision and Image Recognition
Course Details:

Unit I	Morphological Image Processing: Basic concept of set theory, logic operation involving binary images, dilation and erosion, opening and closing, and hit-or-miss transformation. Some basic morphological algorithms – Boundary extraction, region filling, extraction of connected components, convex hull, thinning, thickening, skeletons, and pruning. Extensions to gray-scale images – Dilation, Erosion, Opening and closing, and application of gray scale morphology.
Unit II	Image Segmentation: Detection of discontinuities – Point detection, line detection, edge detection – gradient operators, compass operators, Laplace operators and zero crossing, stochastic gradients, performance of edge detector operators. Amplitude thresholding or window slicing, component labeling, boundary based approaches, region -based approaches and clustering, template matching, and texture segmentation.
Unit III	Boundary Extraction and Representation: Connectivity, Contour following, edge linking, Hough transform, chain code, fitting line segments, B-spline representation, Fourier descriptors, shape number, and autoregressive model.
Unit IV	Region Representation: Run-length codes, quad-trees, topological descriptor, texture and projections.Moment Representation: Moment representation theorem, moment matching, orthogonal moments, moment invariants, applications of moment invariants.
Unit V	Shape feature: Geometric features, moment-based features. Texture: Statistical approaches, structural approaches, and other approaches. Scene matching: Image subtraction, template matching and area correlation, and matched filtering.

Textbooks and References:

1. A. K. Jain, Fundamentals of Digital Image Processing, Pearson Education India, 2015.
2. R. Gonzalez, Richard Woods, Digital Image Processing, Pearson Education India, 2017.
3. M. Sonka, V. Hlavac, R. Boyle, Image Processing, Analysis and Machine Vision, Cl- Engineering , 2014..
4. B. Chanda, D. . Majumder, Digital Image Processing and Analysis, ISBN: 978-81-203- 4325-2, PHI, 2013,
5. D. Forsyth, J.Ponce, Computer Vision: A Modern Approach, Pearson, 2015.
6. R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2010.
7. S. J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.

Course Code: MIT - 404 **Breakup:** 4 – 0 – 0
Course Name: Machine Leaning (ML)

Unit I	**MODULE-1:** • Introduction to Machine Learning (ML), History and Applications of ML, Recent trends in Machine Learning, • Artificial Intelligence (AI), • Types of Machine Leaning, • Machine Learning Pipeline, • Understanding of Data and Datasets, Features Extraction, Features selection, Feature selection Mechanisms • Train, Test and Validation Sets, Imbalanced data, Outliers, Overfitting and Under fitting, • Confusion Matrix, Performance Metrics: Accuracy, Precision, Recall, F-1 Score.
Unit II	**MODULE-2: SUPERVISED LEARNING (REGRESSION/CLASSIFICATION)** • Distance-based methods, Euclidean and Manhattan Distances, Nearest-Neighbours, • Regression: Linear Regression, Cost Function, Multiple Linear Regressions, • Classification: Logistic Regression, Decision Trees, Classification and Regression Trees (CART), Naive Bayes Classifiers, k-Nearest Neighbor (KNN), Support Vector Machines (SVM).
Unit III	**MODULE-3: UNSUPERVISED LEARNING** • Clustering Algorithms: k-Means clustering, Hierarchical Clustering, Probabilistic Clustering,Dimensionality Reduction, Principal components analysis (PCA),
Unit IV	**MODULE-4:** • Analysis and Evaluation of Machine Learning algorithms and Model Selection, • Deep Learning, • Neural Network: Basic Design Of Neural Network, Multilayer Perceptron's (MLP),Activation Function: Logistic Sigmoid,
Unit V	**MODULE-5:** • Semi-supervised Learning, Active Learning, Reinforcement Learning, • Introduction to Bayesian Learning, Recommender System, Case studies.

Textbooks and References:

1. Introduction to Machine Learning – Ethem Alpaydin, MIT Press, Prentice Hall of India.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
3. Patrick Henry Winston, Artificial Intelligence, 3rd Edition, AW, 1999.

Course Code: MIT - 405 **Breakup:** 4– 0 – 0
Course Name: Deep Learning
Course Details:

Unit I	**Linear Algebra Review**: Brief review of concepts from LinearAlgebra. **Optimization**: Types of errors, bias-variance tradeoff, overfitting-underfitting, a brief review of concepts from Vector Calculus and optimization, variants of gradient descent, momentum.
Unit II	**Logistic Regression**: Basic concepts of regression and classification problems, linear models addressing regression and classification, maximum likelihood, logistic regression classifiers.
Unit III	**Neural Networks**: Basic concepts of artificial neurons, single and multilayer percep trons, perceptron learning algorithm, its convergence proof, different activation functions,softmax cross-entropy loss function.
Unit IV	**Recurrent Neural Networks**: Discussion on Recurrent Neural Networks (RNNs), Long- Short, Term Memory (LSTM) architectures, and basics of word embedding. Deep Reinforcement Learning, Autoencoders (standard, denoising, contractive, etc).
Unit V	**ConvNets**: Basic concepts of Convolutional Neural Networks starting from filetering. Convolution and pooling operation and arithmetics of these. **ConvNet Architectures**: Discussions on famous convnet architectures - AlexNet, ZFNet, VGG, C3D, GoogLeNet, ResNet, MobileNet-v1.

Textbooks and References:

1. I. Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT Press, 2016. (http://www.deeplearningbook.org)
2. M. A. Nielsen, Neural networks and deep learning. Vol. 2018, Determination press, 2015.,Determination press San Francisco, CA.
3. F. Chollet. Deep Learning with Python, Manning, 20117.
4. H. Jones, Deep Learning: An Essential Guide to Deep Learning for Beginners Who Want to Understand How Deep Neural Networks Work and Related to Machine Learning and Artificial Intelligence, Createspace Independent Publishing, 2018.

Course Code: MIT - 406 Breakup: 4– 0 – 0
Course Name: Internet of Things
Course Details:

Unit I	**Introduction to IoT**: Genesis of IoT, IoT and Digitization, IoT Challenges, ComparingIoT architectures, a simplified IoT architecture, The core IoT functional Stack, IoT data management and compute stack.
Unit II	**Engineering for IoT Networks**: Sensors, Actuators, Smart Objects, Sensor Networks, IoT Access Technologies, IP as the IoT Network Layer, Applications protocols for IoT.
Unit III	**Data and Analytics for IoT**: An introduction to data analytics for IoT, Machine Learning, Big data analytics tools and technology, edge streaming analytics, network analytics
Unit IV	**IoT in Industry**: Manufacturing, Oil and Gas, Utilities, Smart and Connected Cities, Transportation, Mining, Public Safety.
Unit V	**Cloud Platforms for IOT**

Textbooks and References:

1. D. Hanes, G. Salgueiro, P. Grossetete, R. Barton, J. Henry, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, CISCO.
2. Rajkamal, Internet of Things, McGraw Hill E