PG-R23 Curriculum
With effective from 2023-24

Master of Computer Application

Scheme of Instruction and Syllabi of
MCA I to IV Semester of
Two Year Degree Course

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institute | Affiliated to Osmania University)
Accreditated by NAAC (A++)
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Scheme of Instruction and Syllabi

of

I - IV SEMESTERS

of

TWO YEAR POST GRADUATE PROGRAMME

in

MASTER OF COMPUTER APPLICATIONS (MCA)

R-23 Regulation

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
Affiliated to Osmania University
Kokapet Village, Gandipet Mandal,
Hyderabad–500075.Telangana
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Department of Master of Computer Applications

The Vision of the MCA Department:

To become a premier center in the field of Computer Applications that produces innovative, skillful and socially responsible professionals who can contribute significantly to academics, research and industry.

The Mission of the MCA Department:

1. To empower students with state-of-the-art technologies in Computer Science and its Applications to meet global needs.
2. To develop technical expertise in Computer Applications through collaborative learning and innovation.
3. To encourage lifelong learning, social responsibility, professionalism and ethical practices in addressing real-world challenges.

Programme Educational Objectives of the MCA Department:

Graduates will

PEO 1: Possess a strong foundation in Computer Science Applications, demonstrating proficiency in programming languages, software development and other core areas.

PEO 2: Excel in career by exhibiting societal consciousness, creativity and technical competency in emerging areas of computer applications

PEO 3: Demonstrate a commitment to professional and social responsibility while applying computational thinking, adapting to industry demands, and undertaking professional development activities

Programme Outcomes of the MCA Department

After completion of two year MCA course, the students will be able to:

PO 1: Apply mathematical foundations and concepts of Computer Science to meet the Industry requirements.

PO 2: Analyze, design and investigate complex problems to formulate solutions using domain knowledge with emerging tools and technologies.

PO 3: Develop creative applications with acquired skills to become Information Technology professional.

PO 4: Communicate effectively with diverse teams.

PO 5: Recognize societal needs and develop solutions with professional ethics.

PO 6: Acquire the software project management skills, lifelong learning, career enhancement and to adopt in different professional environment.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

Scheme of Instructions of I Semester of **MCA (Master of Computer Applications)**

SEMESTER – I

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/S		CIE	SEE	
THEORY								
1	23MCC101	Data Structures	3/1	-	3	40	60	4
2	23MCC102	Computer Architecture	3/1	-	3	40	60	4
3	23MCC103	Object-oriented programming using Java	3/1	-	3	40	60	4
4	23MTC103	Mathematical Foundation for Computer Science	3/1	-	3	40	60	4
5	23MTC104	Probability and Statistics for Data Science	3/1	-	3	40	60	4
PRACTICALS								
6	23MCC104	Data Structures Lab	-	3	3	50	50	1.5
7	23MCC105	Java Lab	-	3	3	50	50	1.5
8	23EG101	Professional Communication Skills Lab	-	2	3	50	50	1
		TOTAL	**15/5**	**8**	**-**	**350**	**450**	**24**

L: Lecture **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

Scheme of Instructions of II Semester of **MCA (Master of Computer Applications)**

SEMESTER-II

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/S		CIE	SEE	
THEORY								
1	23MCC106	Database Management Systems	3/1	-	3	40	60	4
2	23MCC107	Web Technologies	3/1	-	3	40	60	4
3	23MCC108	Python Programming	3/1	-	3	40	60	4
4	23MCC109	Operating Systems	3/1	-	3	40	60	4
5	23MCE101/ 23MCE102/ 23MCE103/ 23MCE104	Professional Elective - I	3/1	-	3	40	60	4
PRACTICALS								
6	23MCC110	Database Management Systems Lab	-	3	3	50	50	1.5
7	23MCC111	Web Technologies Lab	-	3	3	50	50	1.5
8	23MCC112	Operating Systems Lab	-	3	3	50	50	1.5
		TOTAL	**15/5**	**9**	**-**	**350**	**450**	**24.5**

L: Lecture **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

Internship is compulsory after II Semester with 3 credits

Professional Elective- I	
23MCE101	Design and Analysis of Algorithms
23MCE102	Business Intelligence and Analytics
23MCE103	Free and Open Source Technologies
23MCE104	Optimization Techniques

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

Scheme of Instructions of III Semester of **MCA (Master of Computer Applications)**

SEMESTER - III

S. No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Max. Marks		
			L/T	P/S		CIE	SEE	
THEORY								
1	23MCC113	Artificial Intelligence and Machine Learning	3/1	-	3	40	60	4
2	23MCC114	Software Engineering	3/1	-	3	40	60	4
3	23MCC115	Data Communications and Computer Networks	3/1	-	3	40	60	4
4	23MCE105/ 106/107/108	Professional Elective- II	3/1	-	3	40	60	4
5	23MEO201/ 23MBO104/ 23MEO202/ 23CEO102	Open Elective-I	3	-	3	40	60	3
PRACTICALS								
6	23MCC116	Machine Learning Lab using Python	-	3	3	50	50	1.5
7	23MCC117	Unified Modeling Language (UML) Lab	-	3	3	50	50	1.5
8	23MCC118	Technical Seminar	-	3	-	50	-	1.5
9	23MCC119	Internship	-	4 weeks	-	100	-	3
		TOTAL	**15/4**	**09**	**-**	**450**	**400**	**26.5**

L: Lecture **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

Professional Elective – II	
23MCE105	Cloud Computing
23MCE106	Big Data Analytics
23MCE107	Distributed Application Development
23MCE108	Social Network Analysis
Open Elective – I	
23MEO201	Intellectual Property Rights
23MBO104	Organizational Behavior
23MEO202	Human Values and Professional Ethics
23CEO102	Disaster Control and Response

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY

Scheme of Instructions of IV Semester of **MCA (Master of Computer Applications)**

SEMESTER - IV

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/S		CIE	SEE	
THEORY								
1	23MCE109/ 110/111/112	Professional Elective – III	3/1	-	3	40	60	4
2	23MCE113/ 114/115/116	Professional Elective – IV	3/1	-	3	40	60	4
3	23MCC120	Project Work	-	24	3	100	100	12
TOTAL			**6/2**	**24**	**-**	**180**	**220**	**20**

L: Lecture **CIE: Continuous Internal Evaluation**

T: Tutorial **P: Practical/Project Seminar/Dissertation** **SEE: Semester End Examination**

Professional Elective – III	
23MCE109	Cyber Security
23MCE110	Soft Computing
23MCE111	Block Chain Technology
23MCE112	Deep Learning
Professional Elective – IV	
23MCE113	Cyber Forensics
23MCE114	Internet of Things
23MCE115	Explainable Artificial Intelligence
23MCE116	Natural Language Processing

CREDIT DISTRIBUTION TABLE

S.No	Syllabus Component	No. of Courses	No. of credits	Credits %
1.	Core Theory	10	40	42.1
2.	Core Practical	10	27	28.4
3.	Core Electives	04	16	16.9
4.	Open Elective	01	03	3.1
5.	Mathematics	02	08	8.5
6.	English	01	01	1.0
	Total	28	95	100

Total No. of Courses: 28 **Total No. of Credits: 95**

Plan of Study of I-IV Semesters of MCA (R23 Curriculum)

SNO	I Semester		II Semester		III Semester		IV Semester	
	Course Name	**L-T-P-C**	**Course Name**	**L-T-P-C**	**Course Name**	**L-T-P-C**	**Course Name**	**L-T-P-C**
1	Data Structures	3-1-3-5.5	Database Management Systems	3-1-3-5.5	Artificial Intelligence & Machine Learning	3-1-3-5.5	Professional Elective – III	3-1-0-4
2	Computer Architecture	3-1--0-4	Web Technologies	3-1-3-5.5	Software Engineering	3-1-0-4	Professional Elective – IV	3-1-0-4
3	Object-oriented programming using Java	3-1-3-5.5	Python Programming	3-1-0-4	Data Communications & Computer Networks	3-1-0-4	Project Work	0-0-24-12
4	Probability and statistics for Data Science	3-1-0-4	Operating Systems	3-1-3-5.5	Professional Elective- II	3-1-0-4		
5	Mathematical Foundation for Computer Science	3-1-0-4	Professional Elective - I	3-1-0-4	Open Elective-I	3-0-0-3		
6	Professional Communication Skills Lab	0-0-2-1			Unified Modeling Language(UML) Lab	3-0-0-1.5		
7					Technical Seminar	0-0-3-1.5		
8					Internship	0-0-0-3		
Hours		**28**		**29**		**28**		**32**
Credits		**24**		**24.5**		**26.5**		**20**

23MCC101

DATA STRUCTURES

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Basic Mathematical Knowledge, Programming for problem solving, Object Oriented Programming.

COURSE OBJECTIVES: This course aims to
1. To learn fundamental concepts of CPP and Object oriented programming
2. To learn linear and non-linear data structures concepts

COURSE OUTCOMES: After completion of this course, student will be able to
After completion of the course, students would be able to:
1. Understand the basic concepts of C++, build classes with functions, constructors and apply OOPS concepts wherever required.
2. Make use of various linear data structures and their implementation according to situations.
3. Apply and Distinguish different sorting techniques and their implementation in real world environment.
4. Implement different collision resolution techniques on hashing.
5. Make use of various non-linear data structures and their implementation according to situations

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	1	2	1
CO2	3	3	3	1	1	1
CO3	2	1	1	1	1	1
CO4	1	1	1	1	1	1
CO5	1	1	1	1	1	1

UNIT- I
C++ Introduction: Overview, Program Structure, tokens, keywords, identifiers, variables, constants, data types, namespace, enum, operators, Overloading of functions, default arguments, inline functions, dynamic memory allocation and De allocation (new and delete).
C++ Class Overview: Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors.

UNIT- II
OOPS Concepts: Inheritance basics, base and derived classes, Inheritance types, base class access control, Friend Functions, this pointer, Templates, Function and class templates, Polymorphism, Function overriding, Runtime Polymorphism using virtual functions, Operator overloading, Exception Handling.

UNIT- III
Stacks: Definition and Operations and Applications, Array and Linked Representation of Stacks. Queues: Definition and Operations, Array and Linked Representation of Queues and their Applications. Linked Lists: Definition and Operations, Double linked list representation, Circular linked lists.
Sparse Matrix: Representation and its efficiency in storage

UNIT- IV
Sorting: Bubble sort, Merge Sort, Selection Sort, heap sort, Quick sort, Insertion sort, Posterior Analysis, Sequential Search, binary search.
Hashing: Hash table, its implementation, Hash table representation, types of hashing, collision resolution techniques.

UNIT- V

Trees: Definitions and Properties, Representation of Binary Trees, Operations. Binary Tree Traversal, Binary search trees, operations- insertion, deletion and searching, heap trees. AVL Tress and Operations on AVL Trees, B-Trees and its operations.

Graphs: Definition and representation of graphs, data structures for representing graphs- edge list structures, adjacency list structures, adjacency matrix, Graph traversals – BFS and DFS. Spanning trees, minimum spanning trees, prim's and kruskal's algorithms.

TEXT BOOKS:

1. E. Balaguruswamy "Object Oriented Programming with C++", Tata McGraw Hill, 4th Edition, 2008.
2. S.Sahani, "Data Structures, Algorithms and Applications in C++", Universities Press. 2ndEdition, 2006.
3. Ellis Horowitz, Sartaj Shani, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, University Press, 2007.

SUGGESTED READING:

1. Langsam, Augenstein and Tanenbaum, "Data structures using C and C++", PHI, 2nd Edition, 2002.
2. Michael T.Goodrich, R.Tamassia and D.Mount, "Data structures and Algorithms in C++", Wiley Student Edition, Seventh Edition, John Wiley and Sons, 2011.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 3rd Edition, Pearson Education. Ltd., 2007.

23MCC102

COMPUTER ARCHITECTURE

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Basic knowledge of Computer components and Digital circuits

COURSE OBJECTIVES: This course aims to

1. To understand the basic operations of Digital logic circuits, register operations, computer instructions
2. To be able to appreciate the role & operations of CPU, I/O organization, memory organization, pipelining & parallel processing

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Identify the operations and utilities of Boolean algebra and K Maps
2. Evaluate the working of Registers and types of Computer instructions
3. Learn the basic computer organization and its design.
4. Classify the operations of CPU and their functionality.
5. Appreciate the input–output, memory organization and concepts of parallel processing.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	1	1	3	1
CO2	1	2	1	1	2	1
CO3	2	3	3	2	3	1
CO4	2	3	3	2	3	1
CO5	3	3	3	2	2	1

UNIT -I

Basic operations of Logic Circuits: Fundamentals of Computer components– Memory – I/O devices - Logic Gates, Boolean algebra, 3 and 4 Variable K Maps, Half Adder and Full Adder, SR flip flop, Multiplexer – Decoder, Registers, and Shift Registers

UNIT -II

Register Transfer and Micro Operations: Register Transfer language, Arithmetic, logical and Shift Micro operations, Instruction codes, CPU Registers, Common bus system, ALU circuit & operation, Computer Instructions, Machine Cycle, Memory Reference Instructions, Interrupts

UNIT -III

Central Processing Unit: Micro programmed Control, Control Memory, Address sequencing, General Register Organization, Stack Organization, Instruction Formats, Nine Addressing Modes, Data Transfer operations

UNIT -IV

Input–Output and Memory Organization: Peripheral Devices, I/O output interface, Asynchronous data transfer, Modes of transfer, Priority Interrupts, DMA controller and DMA process, Input output Processor, 3 types of Cache Memory mapping procedures

UNIT -V

Parallel Processing: CISC & RISC architectures , pipe lining , parallel Processing, , Parallelism V/S Pipelining , Time – space chart mechanism , Shared Memory Multiprocessing, , Multi Programming and Time Sharing.

TEXT BOOKS:

1. M. Morris Mano, "Computer System Architecture", Pearson Asia/Prentice Hall, 5 rd Edn.2013.
2. M.Sasi Kumar, Dinesh Shikhare, P. Ravi Prakash, “Introduction to Parallel Processing”, Published by PHI- 2nd Edition. 2014.

SUGGESTED READING:

1. William Stallings, "Computer Organization & Architecture", Pearson Education, Sixth Edition, 2003.
2. Kai Hwang and Faye A.Briggs, “Computer Architecture and Parallel Processing” International Edition.

23MCC103

OBJECT-ORIENTED PROGRAMMING USING JAVA

Instruction	3L +1T Hours per week
Duration of Semester-End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Problem Solving Skills, Basic knowledge of programming language such as C/C++

COURSE OBJECTIVES: This course aims to

1. To learn object oriented programming principles and fundamentals of Core Java.
2. To understand the basic concepts of Collection Framework, Stream API.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Explain conceptual and practical knowledge of basic Object-Oriented Programming concepts.
2. Develop complex Object-Oriented Programs using distinct OOP principles, apply knowledge of interfaces, packages
3. Develop exception handling mechanism and multithreading.
4. Apply knowledge of string handling, string buffer, and string builder.
5. Identify the importance of the Collections framework, Stream API to develop complex applications with advanced Data Structures.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	3	3
CO2	2	3	3	2	3	2
CO3	2	3	3	2	3	2
CO4	2	2	2	1	3	3
CO5	3	3	3	3	3	3

UNIT -I

Object Oriented Programming: History of Java, and evolution of Java, java Buzzwords, Object Oriented Programming, Data types, Variables and Arrays, Operators, Control Statements.

UNIT -II

Introduction to Classes: Classes, Methods, Constructors, This keyword, Garbage Collection, Overloading, Recursion, nested classes.

Inheritance: Inheritance and its types, super, Overriding, Abstract Classes, Using final.

Packages and Interfaces: packages, Access protection, importing packages, Implementing Interfaces.

UNIT -III

Exceptional Handling: Exception–handling fundamentals, Exception types, Using try and Catch, throw, throws, and finally clauses.

Multithreaded Programming: Java Thread Model, Creating Threads, Interrupting Threads, Thread Priorities, Synchronizing Threads, Inter-thread Communication.

UNIT – IV

String Handling: String class, String buffer class, String length, Special String operations, string comparison, Enumerations, Primitive type wrappers and Auto boxing, Overview of Annotations

Lambda Expressions: Introducing Lambda Expressions, Method References, and Constructor References

Java I/0: Classes and Interfaces, File class, Stream and Byte Classes, Reading and Writing Files.

UNIT –V

The Collections Framework: Introduction and overview of Collections framework, The Collection interfaces, Collection classes – Array List, Linked List, Hash Set, Tree Set, and Priority Queue Accessing Collections via Iterator, working with Maps, Comparable Vs Comparator

Stream API: Stream Basics, Reduction Operations, Using Parallel Streams, Mapping, Collecting, Iterators, and Streams

TEXTBOOKS:

1. Herbert Schildt "Java, The Complete Reference" McGraw Hill Education, JavaTM 10th Edition 2018.
2. R. Nageshwar Rao, "Core Java: An Integrated Approach, New: Includes All Versions Upto Java 8", DreamTech Press, 2016
3. Richard A.Johnson, "Java Programming and Object-Oriented Application Development" Cengage Learning, India Edition 2009.

SUGGESTED READINGS:

1. John Dean and Raymond "Introduction Programming with Java A problem-solving approach", McGraw Hill 2008.
2. Joe Wigglesworth and Paula McMillan, "Java Programming: Advanced Topics" Cengage Learning. 3rd Edition 2009.

23MTC103
MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course the students will be able to:

1. Understand the required propositional logic to test the logic of a program.
2. Examine various properties of Relations and Functions.
3. Identify the basics of Linear Algebra in the form of Matrices and Vectors.
4. Expose the principle of Inclusion and Exclusion as a basis for various Permutations and Combinations.
5. Evaluate the procedural knowledge on Graphs and Trees to derive applications in Computer

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	1	1
CO2	3	2	1	1	1	1
CO3	3	1	2	1	1	1
CO4	3	2	1	1	1	1
CO5	3	1	2	1	1	1

UNIT – I

Fundamentals of Logic: Basic Connectives and Truth Tables, Logical Equivalence, Logical Implication, Use of Quantifiers, Definitions, and the Proof of Theorems. Boolean algebra: Switching functions, Disjunctive and Conjunctive Normal forms, Gating Networks, Minimal sum of Products, Karnaugh maps, Don't care conditions.

UNIT – II

Functions: Cartesian product, Functions, Onto Functions, Special Functions, Pigeonhole Principle, Composition and Inverse Functions. Relations: Partial Order Relations, Hasse diagrams, Lattices, Equivalence Relations.

UNIT – III

Linear Algebra: Linear Algebraic Systems- Matrices and Vectors, Matrix Inverses, Transposes and Symmetric Matrices, Tridiagonal Matrices and Pivoting strategies, Vector Spaces- Real Vector Spaces and Sub spaces, Eigen values and Eigen Vectors.

Minimization and least Squares: Minimization problems, the closest point and least Squares, Introduction to Gradient Descendent Algorithm with example.

UNIT – IV

Principles of Inclusion and Exclusion: Introduction, Generalization of principle, Derangements, Rooks Polynomial, Arrangements with Forbidden Positions. Recurrence Relations: First and second order linear Recurrence relations, Method of Generating Functions.

UNIT – V

Graph Theory: Definitions and examples, Sub graphs, Vertex degree ,Complements and graph isomorphism, Trees: Definitions, Properties and examples, Rooted Trees, Spanning Trees and Minimum Spanning Trees, Shortest path problems using DFS, BFS , Planar graphs: Eulerian and Hamiltonian paths and Cycles, Graph coloring.

TEXT BOOKS:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education, 4th Edition,2003.
2. Peter J. Olver, ChehrzadShakiban, "Applied Linear Algebra", Springer International Publishing, 2nd Edition, 2018.

SUGGESTED READING:

1. Kenneth H Rosen, “Discrete Mathematics and its Applications” Tata McGraw Hill, 6th Edition, 2007.
2. J.P Tremblay & R. Manohar, “Discrete Mathematical Structures with Applications to computer science” McGraw Hill. 1987.
3. Joe L. Mott, A.kandal& T.P. Baker, “Discrete Mathematics for Compute Scientists & Mathematicians", Prentice Hall N.J., 1986
4. Kevin Ferland, “Discrete Mathematics”, Houghton Mifflin Company, 2009

23MTC104

PROBABILITY AND STATISTICS FOR DATA SCIENCE

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

COURSE OBJECTIVES: This course aims to

1. To discuss the skewness and kurtosis.
2. To explain the concept of random variable and mathematical expectation.
3. To explain hypothetical data using probability distribution.
4. To discuss the testing of hypothesis of sample data.
5. To explain the concept and computation of regression curves.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Calculate the measures of skewness.
2. Apply probability on continuous and discrete random variables.
3. Use the basic probability for fitting the Random phenomenon.
4. Apply various tests for testing the significance of sample data.
5. Use the principle of Least Squares approximation for estimation of the data.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	1	1
CO2	3	2	1	1	1	1
CO3	3	2	1	1	1	1
CO4	3	2	1	1	1	1
CO5	3	2	1	1	1	1

UNIT-I

Basic statistics: Measures of Central Tendency: Mean, Median, Mode. Measures of Dispersion: Quartile deviation, Standard deviation, Coefficient of dispersion, Coefficient of variation. Skewness: Karl Pearson's Coefficient of skewness, Bowley's Coefficient of Skewness and Kurtosis. Moments about a point and Moments about the Mean.

UNIT-II

Probability and Mathematical Expectation: Probability, Addition Theorem of probability, Conditional Probability, Multiplication theorem of probability, Bayes Theorem, Random variable, discrete random variable, continuous random variable, Properties of probability mass function and probability density function. Mathematical expectation, properties of expectation, properties of variance and covariance. Two Dimensional random Variables-Two dimensional or Joint Probability Mass Function, Two Dimensional Distribution Function, Marginal Distribution Functions, Joint Density Function, Marginal Density Function , The conditional Distribution Function and Conditional Probability Density Function.

UNIT-III

Probability Distributions: Discrete probability distribution: Poisson distribution, Mean, Variance, MGF, CGF, fitting of Poisson distribution. Continuous probability distributions: Normal distribution, Standard Normal random variable Expectation, Variance, MGF (without proof), CGF, Properties of Normal Curve and Areas under Normal curve. Exponential distribution, Expectation, Variance, MGF, CGF.

UNIT-IV

Testing of Hypotheses: Test of significance, null and alternative hypotheses, Errors in sampling, level of significance. Large sample test: Test of significance for single proportion, difference of proportions, single mean and difference of means. T-Test for single mean, differences of Means. F- test for equality of two population variances. Chi-Square test of Goodness of fit.

UNIT-V

Regression and Curve fitting: Correlation: Karl Pearson's coefficient of correlation. Linear Regression: Lines of regression, properties of regression coefficients. Curvilinear regression: Fitting of Parabola, fitting of a power curve $y = ax^b$, Fitting of Exponential curve $y = ae^{bx}$ *and* $y = ab^x$.

TEXTBOOKS:

1. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

SUGGESTED READING:

1. Walpole, H.Myers, L.Myers, Ye, " Probability and statistics for engineers & Scientists" 9th edition, Pearson publications, 2016.
2. S.C.Gupta, "Fundamentals of Statistics", Himalaya publishing, 7th Edition ,2014.

23MCC104

DATA STRUCTURES LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Basic Mathematical Knowledge, Programming for problem solving, Object Oriented Programming.

COURSE OBJECTIVES: This course aims to

1. To learn and do programs on fundamental concepts of CPP and Object oriented programming
2. To learn and do programs on linear and non-linear data structures concepts

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students will be able to:

1. Build classes with member functions, constructors and destructors. Analyze the different kinds of inheritance types and its functionalities.
2. Make use of various linear data structures concepts in real world environment.
3. Apply and distinguish different sorting techniques and their requirement according to the situations.
4. Implement different collision resolution techniques on hashing.
5. Distinguish the DFS and BFS of graph traversals and their implementations.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	1	2	1
CO2	3	3	3	1	1	1
CO3	2	1	1	1	1	1
CO4	1	1	1	1	1	1
CO5	1	1	1	1	1	1

List of C++Programs:

1. Build C++ programs for Overloading of Functions, Default Arguments.
2. Write a C++ program for Dynamic Memory allocation and De allocation.
3. Illustrate the concept of Class with member functions, Constructors and destructors.
4. Illustrate the concept of templates.
5. Illustrate the concept of Inheritance
6. Implement Stack using Arrays and Linked Lists
7. Write a C++ programs for implementing Queues using Arrays and Linked Lists
8. Implement Linked Lists using Single, double and Circular Linked Lists
9. Write a C++ program for infix to postfix conversion.
10. Implement Hashing.
11. Implement Quick Sort.
12. Implement Insertion Sort.
13. Implement Selection Sort.
14. Implement Merge Sort.
15. Implement Binary Searching
16. Implement Graph Traversals DFS and BFS.

SUGGESTED READING:

1. Herbert Schildt, “Complete reference to C++”, 4th Edition, 2003.
2. E. Balaguruswamy, “Object Oriented Programming with C++”, Tata McGraw Hill, 4th Edition, 2008.
3. V.V.Muniswamy, “Advanced Data structures & Algorithms in C++”,Jaico Publishing House.
4. A.M. Berman, “Data structures via C++”, Oxford University Press.

23MCC105

JAVA LAB

Instruction	3 Hours per week
Duration of Semester-End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Problem Solving Skills, Basic knowledge of programming language such as C/C++

COURSE OBJECTIVES: This course aims to

1. To learn the concept of classes, Inheritance, and abstract classes
2. To demonstrate real-world applications using Java Collection Framework and Stream API.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students will be able to:

1. Demonstrate and model various mathematical computation programs using OOP concepts.
2. Conclude the restrictions on class members using package-level access protection.
3. Apply the forecasting of multiple clients' task execution using Multithreading and exception-handling concepts.
4. Analyze the input as well as output data for String and Stream programming.
5. Identify the usage of Collections framework, Lambda Expressions, and Stream API

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	3	1	2	2
CO2	1	3	3	2	2	2
CO3	2	2	2	2	3	3
CO4	2	2	3	3	3	3
CO5	3	3	3	2	3	3

List of Java Programs

1. Demonstrate the usage of Operators, Control Structures, Arrays, etc.
2. Create classes, objects
3. Demonstrate the usage of constructors
4. Implement Method overloading
5. Implement Method overriding, dynamic method dispatch
6. Demonstrate the concept of Inheritance
7. Implement Interfaces
8. Create and import Packages
9. Implement Exception handling
10. Create Multiple threads
11. Demonstrate String and String Buffer classes
12. Demonstrate Wrapper classes
13. Create I/O streams and files
14. Demonstrate Collections, Lambda Expressions
15. Implement Stream API

SUGGESTED READING:

1. Herbert Schildt "Java, The Complete Reference" McGraw Hill Education, Java TM 9th Edition 2014.
2. Richard A.Johnson, "Java Programming and Object-Oriented Application Development" Cengage Learning, India Edition 2009.

23EG101

PROFESSIONAL COMMUNICATION SKILLS LAB

Instruction	2P Hours per Week
Duration of SEE	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Prerequisite: Basic interpersonal and communication skills

COURSE OBJECTIVES: This course aims to

1. Create awareness about the significance and types of soft skills in formal settings.
2. Develop writing skills for professional communication viz., writing cover letter, Résumé, e-mail, minutes of the meeting, memos and SoP.
3. Analyze their presentation and public speaking skills.
4. Demonstrate their ability to discuss in groups and resolve issues.
5. Understand the process and techniques of attending an interview positively.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of this course, students will be able to:

1. Differentiate various soft skills and build an impressive personality.
2. Draft cover letter, Résumé, e-mail, minutes of the meeting, memos and SoP effectively.
3. Deliver effective presentations in professional contexts confidently.
4. Participate in Group discussions and resolve issues proficiently.
5. Face interviews successfully.

CO-PO Articulation Matrix

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	1	1	1	2	3	2
CO 2	1	1	1	1	1	3
CO 3	1	1	1	2	2	3
CO 4	1	1	1	3	3	3
CO 5	1	1	1	2	1	3

UNIT - I

Behavioral Skills: Introduction to Various Forms of Soft Skills – Hard Skills vs Soft Skills, Self-Awareness and SWOT Analysis –Techniques of Personality Development –Corporate Culture and Grooming – Professional Etiquette.

UNIT - II

Writing Skills: Cover Letter and Résumé Writing – Structure, Planning and Presentation: Thinking Skills, Defining the Career Objective, Projecting Ones Strengths and Skill-sets–Email Writing–Mechanics of Professional Meetings – Preparation of Agenda, Participation, Writing Minutes of a Meeting and Memorandum –Writing an Effective Statement of Purpose (SOP).

UNIT - III

Presentation Skills: Elements of Effective Presentation – Structure of a Presentation, Presentation Tools, Self-confidence and Assertiveness, Body Language, Eye-contact, Visual Aids, Preparing an Effective PPT**,** Time Management–Public Speaking.

UNIT - IV

Group Discussion: GD as Part of Selection Procedure and its Dynamics, Intervention, Summarizing, Modulation of Voice, Relevance of Body Language, Fluency, and Coherence – Advanced Group Discussion with Case Studies, Team Building & People Management, Decision Making and Problem Solving and Leadership Skills.

UNIT - V

Interview Skills: Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Stress Management & Conflict Resolution– Mock Interviews. LinkedIn Profile Building.

TEXT BOOKS:

1. Sen, Leena, "Communication Skills", Prentice-Hall of India, New Delhi, 2005.
2. Verma, Shalini. "Body Language - Your Success Mantra", S Chand & Company, New Delhi, 2006.
3. Ramesh, Gopalswam. and Mahadevan Ramesh, "The ACE of Soft Skills: Attitude, Communication and Etiquette for Success", Pearson, New Delhi, 2010.
4. Gulati and Sarvesh, "Corporate Soft Skills", Rupa and Co., New Delhi, 2006.

SUGGESTED READING:

1. Thorpe, Edgar. and Showick Thorpe, "Objective English", 2nd edition, Pearson Education, 2007.
2. Van Emden, Joan, and Lucinda Becker, "Presentation Skills for Students", Palgrave Macmillan, New York, 2004.
3. Covey, Stephen R. "The 7 Habits of Highly Effective People", Free Press, New York, 1989.

23MCC106

DATABASE MANAGEMENT SYSTEMS

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Discrete mathematics of computer science, Programming skills

COURSE OBJECTIVES: This course aims to

1. Learn the basic fundamentals of database. Understand the data models. SQL and relational database design.
2. Data storage techniques and query processing.t knowledge in transaction processing, concurrency control techniques. Study the concepts of system crash and recovery management.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course the students would be able to:

1. Acquire the knowledge of the basic concepts of the database.
2. Create the data models. Map ER models into Relations and normalize the relations
3. Impart the knowledge of query evaluation, data storage and accessing.
4. Gain the concepts of concurrent execution and transaction management.
5. Analyze the issues in system crash and recovery measures.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	2	2	2
CO2	1	3	2	1	2	2
CO3	1	2	2	2	2	1
CO4	2	2	1	1	2	2
CO5	2	1	2	2	2	2

UNIT-I

Introduction to DBMS and DB Models: File system Vs. DBMS, Advantages of DBMS, Data Abstraction, Database Design, and ER diagrams, Entities, Attributes and Entity Sets, Relationship Sets, Additional features of ER model, Conceptual Design with the ER model. The Relational Model: Introduction to the Relational Model, Integrity Constraints over relations,

UNIT-II

Introduction to SQL, creating tables, views, destroying / Altering Tables and Views, Set Operations, Null Values, Additional Basic Operations, Aggregate Functions, Nested Sub queries, Join Expression. Advanced SQL: SQL Data Types, Integrity Constraints, Cursors, Procedures, functions Authorization and Triggers.

UNIT-III

Big Data: Key-value Stores and Semi structured Data, Functional Dependencies, Normal Forms, Basic Concepts of File Organization, Indexing, Index Data Structures, B+ Trees: A dynamic index structure, format of a node, search, Insert, Delete. Hash-Based Indexing: Static Hashing, Extendable Hashing, Linear Hashing, Extendable Hashing versus Linear Hashing.

UNIT-IV

Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control. Concurrency Control: 2PL, Serializability, and Recoverability, Introduction to Lock Management, Dealing with Deadlock, Specialized Locking Techniques, Concurrency Control without Locking.

UNIT-V

Crash Recovery: Introduction to ARIES, The Log, Other Recovery Related Structures, The WAL, Check pointing, recovering from a system Crash, Media recovery. Security and Authorization: Introduction to database security, Access Control Discretionary Access control, Mandatory access control. Additional Issues related to Security.

Text Book:

1. Silberschataz, Korth, Sudarshan "Database System Concepts", 5th Edition McGraw Hill 2011.

SUGGESTED READING:

1. Raghu Ramakrishna, Johannes, Gehrke "Database Management Systems", 3rd Edition, Mc-Graw Hill 2003
2. Ramez Elmasri, Shamkant B. Navathe, Somayajulu, Gupta "Fundamentals of Database systems", Pearson Education 2006.

23MCC107

WEB TECHNOLOGIES

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Knowledge of programming fundamentals and web basics

COURSE OBJECTIVES: This course aims to

1. To Acquire knowledge of HTML5, Java Script and XML to develop client-side web applications.
2. To Acquire knowledge of React JS and to develop web applications

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Develop web pages using HTML 5.
2. Apply CSS concepts to present the document.
3. Perform client-side validations and create interactive web pages using JavaScript.
4. Create XML documents.
5. Build an application using React JS

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	3	1	1	1
CO2	1	1	3	1	1	1
CO3	1	2	3	1	1	1
CO4	1	1	2	1	1	1
CO5	1	2	3	1	1	1

UNIT – I

HTML5: Internet and web, Introduction to web technologies, Exploring new features of HTML5 , Fundamentals of HTML : Basic tags and elements , Working with text: formatting tags, Organizing text in HTML: DIV and SPAN tags, Working with Links and URL, Creating Tables, working with images, colors and canvas, working with forms, working with multimedia Cascading Style Sheets (CSS): Overview of CSS : CSS Selectors, Style Sheets, Backgrounds, and color Gradients, Fonts and Text styles, Creating Boxes and columns , Displaying , positioning and Floating an element, List styles, Table Layouts , Pseudo-classes and Pseudo-Elements, Effects, frames and controls

UNIT – II

JavaScript: overview of JavaScript: Features, Programming fundamentals, Functions, Events, image maps and animation, Java Script Objects: properties and methods of object, built-in objects

UNIT-III

Java Script advanced concepts: Working with Browser objects: window object, Navigator Object, History Object, screen object, working with Document Object, Document Object Model, validation, errors, Debugging, Exception handling and Security

UNIT –IV

XML: Working with Basics of XMl, Implementing Advanced features of XML, Converting XML documents in other formats.

React JS: Fundamentals of react: Requirements, setting up react project, React JSX, Lists, Components, React DOM, Handler Function in JSX, props, state,

UNIT-V

React JS : Hooks , Custom Hooks, React Fragments**,** Asynchronous Data, Data Fetching & Re-Fetching with React, Memorized Handler, Async/Await, Forms in React, class component, CSS ,SVG'**s,** sample examples

TEXT BOOKS:

1. "HTML 5 Black Book", DT Editorial Services, DreamTech Press, 2019
2. Robin Wieruch , "The Road to React" , Lean Publishing . 2020

SUGGESTED READING:

1. Thomas Powell "HTML & XHTML: The Complete Reference", 4th Edition, Tata McGraw-Hill, 2003.
2. Thomas A Powell, Fritz Schneider "JavaScript: The Complete Reference", 3rd Edition, Tata McGraw Hill, 2013.

23MCC108

PYTHON PROGRAMMING

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Concepts of Problem Solving

COURSE OBJECTIVES: This course aims to

1. To train on the latest programming subject python
2. To train on the python functions and modules.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Read, write, execute by hand simple Python programs.
2. Decompose a Python program into functions.
3. Represent compound data using Python lists, tuples, and dictionaries.
4. Read and write data from/to files in Python Programs
5. Handling exceptions and understanding GUI programs

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	1	1
CO2	3	2	1	1	1	1
CO3	2	1	3	3	3	1
CO4	2	3	3	2	1	1
CO5	3	2	1	3	2	2

UNIT-I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Data Types and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops

UNIT-II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT-III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function. Modules: Modules, Standard Modules, Packages.

UNIT-IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.

UNIT-V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behaviour of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions. Graphical User Interfaces: The Behaviour of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

TEXT BOOKS

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
3. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
4. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

REFERENCE BOOKS

1. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India
2. Python Programming Fundamentals- A Beginner's Handbook by Nischay kumar Hegde
3. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication
4. Introduction to Python for Engineers and Scientists, By. Sandeep Nagar, Apress
5. MicroPython for the Internet of Things (A Beginner’s guide to programming with Python on microcontrollers) By. Charles Bell, Apress

23MCC109

OPERATING SYSTEMS

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Computer Architecture and Programming Fundamentals

COURSE OBJECTIVES: This course aims to

1. To learn fundamentals of Operating system concepts system calls, processes, threads and process scheduling.

2. To learn the concepts of process synchronization, dead locks, memory management, file systems, I/O system.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Understand the fundamental components of a computer operating system and the interactions among them.
2. Analyze the CPU scheduling algorithms, threading models, Build applications using semaphores and monitors to synchronize their operations.
3. Illustrate the deadlock handling methods, Memory management Techniques, analyze the performance of CPU scheduling and page replacement algorithms.
4. Implement File System concepts, analyze the disk scheduling algorithms and RAID Levels.
5. Illustrate the I/O System Concepts, analyze the System Security and System Protection.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	1	1	1
CO2	2	2	2	1	1	1
CO3	2	2	2	1	1	1
CO4	1	1	1	1	1	1
CO5	1	1	2	1	1	2

UNIT-I

Operating System Introduction: Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems.

System structures: Operating System Services, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, Operating System Structure, Virtual Memory, Operating System debugging.

Process Concept: Process Concept, Process Scheduling, Operations on process, Inter process Communication.

UNIT–II

Multithreaded Programming: Thread Definition, Single Thread, Multi threads, Multithreading Models, Thread Libraries, Threading Issues.

Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple Processor Scheduling.

Process Synchronization: Critical Section Problem, Peterson’s Solution, Semaphores, Classic Problems of Synchronization, Monitors.

UNIT- III

Deadlocks: System Model, Deadlock Characterization, Methods in Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Memory Management Strategies: Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation. Virtual Memory Management: Demand Paging, Copy on Write, Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT- IV

File System: File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File Sharing, Protection. Implementing File System: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery.

Secondary Storage Structure: Overview of Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap Space Management, RAID Structure.

UNIT- V

I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, STREAMS.

System Security: The Security Problem, Program Threats, System and Network Threats, User Authentication, Implementing Security Defenses.

System Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix.

TEXT BOOKS:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons, 2011.

SUGGESTED READING:

1. Gary Nutt, "Operating Systems", 3rd Edition, Pearson Education, 2004.
2. Harvey M. Deital, "Operating Systems", 3rd Edition, Pearson Education, 2004.

23MCE101

DESIGN AND ANALYSIS OF ALGORITHMS
(PROFESSIONAL ELECTIVE-I)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Basics of Data Structures and Algorithms

COURSE OBJECTIVES: This course aims to

1. To provide an introduction to understand, analyze the time complexities of algorithms.
2. To introduce the different algorithmic approaches for problem solving through numerous example problems.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Analyze the time and space complexities of algorithms.
2. Explain different algorithmic design techniques.
3. Apply important algorithmic design paradigms.
4. Analyze complex problems to find out optimal solutions.
5. Design and Analyze non deterministic algorithms to solve polynomial and non-polynomial problems.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	2	1	1	1
CO2	3	3	2	1	2	1
CO3	2	2	2	1	1	1
CO4	1	2	1	1	1	1
CO5	1	2	1	1	1	1

UNIT-I

Introduction: Algorithm Definition, Algorithm Specification, Performance Analysis. Review of Elementary Data Structures: Stacks, Queues, Trees, Dictionaries, Priority Queues, Sets and Disjoint Set Union.

UNIT-II

Divide and Conquer: General Method, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Stassen's Matrix Multiplication. Greedy Method: General method, Knapsack problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Optimal Storage on Tapes, Optimal Merge Patterns.

UNIT-III

Dynamic Programming: General Method, Multistage Graphs, All-Pairs Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Traveling Salesmen Problem. Basic Traversal and Search Techniques: Breadth First Search (DFS) and Traversal, Depth First Search (DFS) and Traversal, Connected Components and Spanning Trees, Bi-connected Components and DFS.

UNIT-IV

Backtracking: General Method, 8-Queen's Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles, Knapsack Problem.Branch and Bound: The Method, 0/1 Knapsack Problem, Traveling Salesperson Problem.

UNIT -V

NP-Hard and NP-Complete Problems: Basic Concepts, Cook's Theorem, NP-Hard Graph Problems and NP-Hard Scheduling Problems.

TEXT BOOK:

1. Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, University Press, 2007.

SUGGESTED READING:

1. R. Pannerselvam "Design and Analysis of Algorithms", PHI, 2007.
2. Hari Mohan Pandey, "Design and Analysis of Algorithms", University Science Press, 2009.
3. Aho, Hopcroft, Ullman "The Design and Analysis of Computer Algorithms", Pearson Education, 2000.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein "Introduction to Algorithms", 2ndEdition, Prentice Hall of India Private Limited, 2006.
5. Anany Levitin "Introduction to the Design & Analysis of Algorithms", Pearson Education, 2003.
6. Parag H.Dave, Himanshu B. Dave "Design and Analysis of Algorithms", Pearson Education, 2nd Edition, 2014.

23MCE102

BUSINESS INTELLIGENCE AND ANALYTICS
(PROFESSIONAL ELECTIVE-I)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Awareness of business process & basic knowledge and understanding of Data mining & Data ware house

COURSE OBJECTIVES: This course aims to

1. To understand the role & responsibilities of Business analyst in analysis & analytics
2. To be able to evaluate the requirement of predictive analytics, Datamining, business reporting for the purpose of achieving an appropriate decision making

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Get clear idea about the basic concepts on Business Analytics in an organization.
2. Identify detailed knowledge about the role of Business Analysts in decision making.
3. Distinguish between Descriptive, Predictive and Prescriptive Analytics.
4. Gain knowledge on Data Warehousing and Data Mining concepts.
5. Analyze the usefulness of Business analytics in various functional areas of an organization along with features of big data and its implications**.**

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	3	3	3	3	1
CO2	2	2	2	3	3	1
CO3	3	3	2	2	3	1
CO4	3	3	3	2	3	3
CO5	2	3	3	2	3	2

UNIT- I:

Introduction: Introduction to Analytics, challenges from outside and within, BASP (Business analytics success pillars) framework, Applications of Analytics to different domains, Data, Information, and Knowledge, Analyst's Role in the BA Model – Three Requirements the Analyst Must Meet , Required Competencies for the Analyst , Hypothesis-Driven Methods, Target Variables, Explorative Methods.

UNIT- II:

Descriptive Analytics: Four types of business models, Descriptive analytics -Data warehousing-concepts, characteristics, Data marts, Meta data, Business Reporting, Visual Analytics and Business performance measurement, Data Warehouse Architecture.

UNIT- III:

Predictive Analytics: Introduction, Data mining concepts and Applications, Data mining process, methods, Text mining-introduction, text analytics and sentiment analytics. Web mining- introduction, Web analytics and social analytics.

UNIT- IV:

Prescriptive Analytics: Introduction- categories of models- optimization, simulation, heuristics, automated decision systems and Expert systems, Knowledge Management and collaborative systems, SEMMA and CRISP models

UNIT-V:

Big Data: Introduction to Big Data, Big Data Landscape, Business Implications of Big Data, Big Data technologies , Management of Big Data, fundamentals of big data analytics.

TEXT BOOKS:

1. Ramesh Sharada, DursunDelen, Efraim Turban,“ Business intelligence and analytics” Pearson, 2nd Edition 2021
2. Jean paulisson,jesse s.harriot,”Win with advanced Business analytics” Wiley and SAS.- 3 Edition 2020

Suggested Readings:

1. Gert H.N. Laursen, JesperThorlund “Business Analytics for Managers” JohnWiley& Sons, Inc., 2019

23MCE103

FREE AND OPEN SOURCE TECHNOLOGIES

(PROFESSIONAL ELECTIVE-I)

Instruction	3L +1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Programming for problem solving, Object Oriented Programming.

COURSE OBJECTIVES: This course aims to

1. Expose students with OSS Projects, Advantages of Open Source.
2. Make the students understand the principles, methodologies, policies, licensing procedures and ethics of FOSS.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Identify various FOSS tools, platforms, licensing procedures and development models, ethics
2. Describe various FOSS projects, development models and project management
3. Adapt to the usage of FOSS tools and technologies.
4. Distinguish between Proprietary and Open Source tools, development methods
5. Practice Open Source principles, ethics and models and Evaluate various Open Source projects like Linux, Apache, GIT

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	1	1	1
CO2	3	2	2	1	1	1
CO3	2	2	2	1	1	1
CO4	1	1	1	1	1	1
CO5	1	1	2	1	1	2

Unit - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source, uses and advantages of Free and Open Source Software.

Unit – II

Principles and Open Source Methodology- Open Source Initiatives, Open Standards Principles, Methodologies, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

Unit – III

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media, How to create your own Licenses, Important FOSS Licenses (Apache, BSD,GPL and LGPL).

Unit – IV

Open Source Ethics- Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Unit – V
Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, LibreOffice

TEXT BOOKS:
1. Kailash Vadera, Bhavyesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press.

SUGGESTED READING:
1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

Online Resources:
1. https://fossee.in/
2. https://opensource.com
3. https://www.gnu.org/

23MCE104

OPTIMIZATION TECHNIQUES
(PROFESSIONAL ELECTIVE-I)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites : Mathematical Foundation for Data Science

Course Objectives: This course aims to

1. Learn the basic concepts of Optimization
2. Emphasis of this course is on different classical Optimization techniques linear programming and simplex algorithms.

Course Outcomes: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Basic methods, principles in optimization.
2. Formulation of optimization models, solution methods in optimization.
3. Finding initial basic feasible solutions.
4. Methods of linear and non-linear (constrained and unconstrained) programming.
5. Applications to engineering problems.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	3	3	2	3
CO2	3	2	2	2	2	2
CO3	2	3	2	2	3	3
CO4	2	2	2	2	2	2
CO5	2	2	2	2	2	2

UNIT-I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem –design vector –design constraints –constraint surface –objective function –objective function surfaces –classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization –multi variable Optimization without constraints –necessary and sufficient conditions for minimum/maximum –multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers –multivariable Optimization with inequality constraints –Kuhn –Tucker conditions –Numerical examples.

UNIT-II

Unit Two Linear Programming : Standard form of a linear programming problem –geometry of linear programming problems –definitions and theorems –solution of a system of linear simultaneous equations –pivotal reduction of a general system of equations –motivation to the simplex method –simplex algorithm –Numerical examples.

UNIT-III

Nonlinear Programming –One Dimensional Minimization method. Introduction, Unimodal function, Elimination methods-Unrestricted Search, Exhaustive Search, Dichotomous Search, Fibonacci Method, Golden Section Method and their comparison; Interpolation methods -Quadratic Interpolation Method, Cubic Interpolation Method and Direct Root Methods –Numerical examples.

UNIT-IV

Unconstrained & Constrained Nonlinear Programming

Unconstrained Optimization Techniques: Introduction-Classification of Unconstrained Minimization Methods, General Approach, Rate of Convergence, Scaling of Design Variables; Direct Search methods-Random Search Methods, Grid Search Method, Pattern Directions, Powell's Method and Simplex Method Constrained Optimization Techniques: Introduction, Characteristics of a Constrained Problem, Direct Search Methods - Random Search Methods, Basic Approach in the Methods of Feasible Directions, Rosen's Gradient Projection Method, Generalized Reduced Gradient Method and Sequential Quadratic Programming.

UNIT V

Dynamic Programming

Dynamic programming multistage decision processes –types –concept of sub optimization and the principle of optimality –computational procedure in dynamic programming –examples illustrating the calculus method of solution -examples illustrating the tabular method of solution –Numerical examples.

TEXT BOOKS:

1. S. S. Rao, "Engineering optimization": Theory and practice 3rd Edition, New Age International (P) Limited, 1998.
2. H.S. Kasana & K.D. Kumar, "Introductory Operations Research Springer (India)", 2004.

SUGGESTED READING:

1. R Fletcher, "Practical Methods of Optimization", 2ndEdition, Wiley Publishers, 2000.
2. Jorge Nocedal and Wright S, "Numerical Optimization Springer", 1st Edition, 1999.
3. K.V. Mital and C. Mohan, "Optimization Methods in Operations Research and systems Analysis" 3rdEdition, New Age International (P) Limited, 1996.
4. S.D. Sharma, "Operations Research",Kedar Nath, 2012.
5. H.A. Taha, "Operations Research", 9thEdition, An Introduction Pearson, 2010.
6. G. Hadley, "Linear Programming", Narosa, 2002.

23MCC110

DATABASE MANAGEMENT SYSTEMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Concepts of Database Management System

COURSE OBJECTIVES: This course aims to

1. Become familiar with the concepts of structured query language.
2. Understand about programming language / structured query language (PL/SQL).

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the student will be able to:

1. Implement SQL commands.
2. Declare and enforce integrity constraints on a database.
3. Build the views with multiple options.
4. Develop PL/SQL programs using stored procedures, functions, cursors and packages.
5. Create user access and authorization controls.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	1	2	2
CO2	1	2	1	2	1	1
CO3	1	2	1	1	2	1
CO4	2	2	2	2	1	2
CO5	3	2	2	2	2	1

List of Programs

I. SQL

1. Creating tables using commands in DDL
2. Manipulating the data using DML
3. Apply the built-in function and write simple queries on various databases
4. Using Aggregate functions Set operators
5. Simple condition query creation using SQL Plus
6. Complex condition query creation using SQL Plus
7. Exercising all types of Joins, views
8. Exercising Data Control Language and Transaction Control Language

II. PL/SQL

9. Demonstration of Blocks
10. Cursors, implicit and explicit
11. Procedures,
12. Functions
13. Packages.
14. Creation of Triggers

Note:-The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

SUGGESTED READING:

1. Nilesh Shah "Database Systems Using Oracle", PHI, 2007.
2. Rick F Van der Lans "Introduction to SQL", 4th Edition, Pearson Education, 2007.
3. Benjamin Rosenzweig, Elena Silvestrova "Oracle PL/SQL by Example", 3rd Edition, Pearson Education, 2004.
4. Albert Lulushi, "Oracle Forms Developer's Handbook", Pearson Education, 2006.

23MCC111

WEB TECHNOLOGIES LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Knowledge of programming fundamentals and web basics

COURSE OBJECTIVES: This course aims to

1. To gain knowledge of developing web pages
2. To gain knowledge of building applications using latest Technologies

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Develop static web pages.
2. Present the documents in professional way.
3. Construct interactive web pages.
4. Perform client side validations.
5. Build web applications using React JS.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	3	1	1	1
CO2	1	1	3	1	1	1
CO3	1	2	3	1	1	1
CO4	1	1	2	1	1	1
CO5	1	2	3	1	1	1

HTML5	1. Text Markup Tags 2. Images., colors and canvas 3. Hyperlinks. 4. Ordered and Unordered Lists 5. Tables and Nested Tables 6. multimedia 7. Forms.
CSS	8. Inline Stylesheet, Internal Stylesheet. External Stylesheet and Pseudo Classes 9. Backgrounds, and color Gradients, Fonts and Text styles, Creating Boxes and columns D 10. Positioning and Floating an element, List styles, Table Layouts , frames and controls
JAVASCRIPT	11. Selection statements, switch statements and loop statements 12. Pre-defined objects (Date, String, Math etc.,). 13. Functions. 14. Array object. 15. User-defined objects 16. Handle various events occurred in the HTML document 17. Positioning elements, moving elements, elements visibility, stacking elements and slow movement of elements.
XML	18. Store the information in the XML Documents 19. CSS style sheets for the XML documents
REACT JS	20. Components, React DOM, Handler Function in JSX, props, state

21. Hooks, Custom Hooks, React Fragments, Asynchronous Data
22. Data Fetching & Re-Fetching, Forms
23. class component, CSS , SVG's

SUGGESTED READING:

1. "HTML 5 Black Book", DT Editorial Services, DreamTech Press, 2019
2. Robin Wieruch , "The Road to React" , Lean Publishing . 2020

23MCC112

OPERATING SYSTEMS LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Operating system Concepts and Programming for problem solving Using C

COURSE OBJECTIVES: This course aims to

1. Learn basic shell programs, programs on process scheduling algorithms
2. Learn programs on Inter process Communication, programs on synchronization problems, programs on files

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students would be able to:

1. Implement basic shell programs
2. Build programs on process scheduling algorithms
3. Implement programs on Inter process Communication.
4. Build programs on synchronization problems
5. Implement programs on files

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	1	1	1
CO2	2	2	2	1	1	1
CO3	2	2	2	1	1	1
CO4	1	1	1	1	1	1
CO5	1	1	1	1	1	2

List of Programs:

1. Basic shell scripts.
2. Write a C program for fork system call.
3. Implement a C program for FCFS scheduling algorithm.
4. Implement a C program for SJF scheduling algorithm.
5. Implement a C program for PRIORITY scheduling algorithm.
6. Write a C program for IPC by using pipes
7. Write a C Echo server-using pipes.
8. Write a C Echo server-using message Queues.
9. Write a C Producer & Consumer Problem using Semaphores
10. Write a C Readers & Writers Problem using Semaphores
11. Write a C Dining Philosopher's problem using semaphores.
12. Write a C program for printing home directory Path of the current user
13. Write a C program for printing password information of the current user by userid or user name
14. Write a C program for Create and write the contents and red the contents of file
15. Write a C program for Copying content of one file to another file

SUGGESTED READING:

1. W. Richard Stevens, "**Unix Network Programming**", Pearson Education Inc, PHI Learning 1990.
2. Behrouz A. Forouzan, Richard F. Gilberg, "**UNIX and Shell Programming: A Textbook**", Books/Cole-Thomson Learning, 2003.

23MCC113

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC101, 23MTC32

COURSE OBJECTIVES: This course aims to

1. To understand the various definitions of Artificial intelligence, Agent functionality, various problem solving approaches.
2. To know the various machine learning algorithms

COURSE OUTCOMES: After completion of this course, student will be able to

1. Differentiate between elementary Problem and AI problem.
2. Determine and evaluate the various problem solving strategies.
3. Determine and evaluate the various search strategies.
4. Learning various supervised machine learning algorithms
5. Learning Clustering techniques.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	1	2	1
CO2	1	2	3	1	3	3
CO3	1	1	1	2	2	2
CO4	1	1	1	1	2	2
CO5	3	2	1	1	2	2

UNIT - I

Introduction : Definitions of artificial intelligence, The Foundations of Artificial Intelligence , The History of Artificial Intelligence , The State of the Art , AI Techniques, Intelligent Agents : Agents and Environments , Good Behavior: The Concept of Rationality , The Nature of Environments , The Structure of Agents,

UNIT - II

Problem-solving : Solving Problems by Searching , Problem-Solving Agents , Example Problems, Searching for Solutions , Uninformed Search Strategies , Informed (Heuristic) Search Strategies , Heuristic Functions , Beyond Classical Search : Local Search Algorithms and Optimization Problems , Local Search in Continuous Spaces , Searching with Nondeterministic Actions , Searching with Partial Observations , Online Search Agents and Unknown Environments .

UNIT – III

Adversarial Search: Games , Optimal Decisions in Games , Alpha–Beta Pruning , Imperfect Real-Time Decisions , Stochastic Games . Partially Observable Games, State-of-the-Art Game Programs , Alternative Approaches. Constraint Satisfaction Problems (CSP): Defining Constraint Satisfaction Problems , Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs , Local Search for CSPs , The Structure of Problems .

UNIT – IV

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, Learning Types-Supervised, Unsupervised, deep learning, bio-inspired adaptive systems, Machine Learning, and big data. Classification Algorithms: Linear classification, logistic regression, classification metrics, ROC curve.

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis. Decision Trees and Ensemble Learning: Binary Decision trees, Introduction, to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

UNIT – V

Support Vector Machines: Linear SVM, Kernel based Classification. Clustering Fundamentals: Basics, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering. Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction

Textbook

1. Russel,S., and Norvig,P., (2015), Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall
2. Elaine Rich, Kevin Night, Shivashankar B Nair, "Artificial Intelligence",3rd Edition.,2008
3. Giuseppe Bonaccorso, "Machine Learning Algorithms", 2nd Edition, Packt, 2018.
4. Tom Mitchel "Machine Learning", Tata McGraW Hill, 2017

SUGGESTED READING:

1. Yang, Q. (1997), Intelligent Planning: A decomposition and abstraction based approach, Springer Verlag, Berlin Heidelberg.
2. Abhishek Vijavargia "Machine Learning using Python", BPB Publications, 1st Edition, 2018
3. ReemaThareja "Python Programming", Oxford Press, 2017
4. Yuxi Liu, "Python Machine Learning by Example", 2nd Edition, PACT, 2017

23MCC114

SOFTWARE ENGINEERING

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC103, 23MCC106 and Programming for problem solving

COURSE OBJECTIVES: This course aims to

1. To provide an understanding of the working knowledge of the techniques for analysis, design, testing and quality management of large software development projects.
2. To get acquainted with process models, software requirements, software design, software testing, software process, risk management, quality management, software configuration management

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Identify the basics of software engineering principles and importance of software Requirements specification.
2. Acquire the knowledge and requirement of software development models.
3. Classify the importance of software design and architecture principles and models.
4. Acquaint with the software testing approaches and levels of testing
5. Analyze the concepts of risk management, software reengineering, reverse engineering and software maintenance activities.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	1	1	1	1
CO2	1	1	1	2	1	2
CO3	1	3	2	1	2	1
CO4	1	2	2	3	2	2
CO5	2	2	2	2	3	3

UNIT-I

Introduction to Software Engineering: Software Engineering Challenges, Software Engineering approach, Software Process, Waterfall, Iterative, Prototype, Incremental, Spiral Model, V model, Agile Model.

UNIT- II

Requirements specification, SRS Structure, Problem analysis, IEEE format of SRS, Function Oriented Design: Design Principles, Module-level concepts, Design notations and specifications, coupling and cohesion concepts, To-down and Bottom-up approaches.

UNIT-III

Structured design methodology, Software Architecture: Role of Software Architecture, Architecture views, Component and Connector view. Risk Engineering - Risk Analysis and Management. RMMM Techniques.

UNIT-IV

Effort Estimations, Schedule Estimation, Software cost Estimation, COCOMO, Function Point Analysis. White box and black box testing approaches, unit testing, integration testing, system testing, and acceptance testing.

UNIT-V

Software Maintenance, Maintenance activities, Software Reengineering, Reverse Engineering, Forward Engineering, Software configuration management.

TEXT BOOKS:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa Publishing House, 2010.
2. Roger S, Pressman's, "Software Engineering: A Practitioner's Approach", 6th Edition, Tata Mc Gr Hill, 2010.

23MCC115

DATA COMMUNICATIONS AND COMPUTER NETWORKS

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: Basic Programming and Problem solving, Computer fundamentals

COURSE OBJECTIVES: This course aims to

1. To understand the principles of data communications and computer networks.
2. To understand routing protocols, transport layer and application layer protocols.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Interpret the various features of Data Communications and understand the functions of different layers of ISO model.
2. Analyze the various protocols and Access methods of Data Link layer and MAC sub Layers.
3. Experiment With various Routing Algorithms of Network layer.
4. Apply Transport layer Services and protocols such as TCP, UDP.
5. Evaluate internals of main protocols such as HTTP, FTP, SMTP and DNS services of Application layer and security issues in computer networking.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	2	1
CO2	1	2	2	1	2	2
CO3	2	1	1	1	2	2
CO4	1	2	1	1	1	2
CO5	2	1	1	1	2	2

UNIT - I

Data Communications: Components, Data Representation, Data Flow, Networks: Network Criteria, Physical Structure, Network Types, Network models: ISO/OSI model, TCP/IP Protocol Suite, Physical layer: Data and Signals, Transmission Impairment, Performance, Digital Transmission: Digital-to-Digital Conversion – List Line coding Schemes, Transmission Modes, Transmission Media: Guided media, unguided media.

UNIT-II

Data link Layer: Error detection and Correction: Block coding, CRC, Data Link Control (DLC): DLC Services, Data-Link Layer Protocols, HDLC, Point-to-Point Protocol (PPP), Media Access Control (MAC): Random Access, Controlled Access, Channelization.

UNIT-III

Network Layer: Network-Layer Services, Packet Switching, Network Layer Performance, IPV4 Addressing Network Layer Protocols: Internet Protocol (IP), Unicast Routing: Routing Algorithms, Unicast Routing Protocols, IPV6 Addressing and Protocol, Transition from IPV4 to IPV6.

UNIT-IV

Transport Layer: Transport Layer Services, Connection oriented and Connectionless Protocols, Transport Layer Protocols, User Datagram Protocol (UDP), Transmission Control Protocol (TCP).

UNIT-V

Application Layer: World Wide Web (WWW) and HTTP, FTP, TELNET, SSH, Domain Name Space (DNS), SMTP, BITTORRENT, Network Security: Security Goals, Attacks, Symmetric and Asymmetric cryptography Basis, Firewalls.

TEXT BOOKS:

1. Behroz A Forouzan, “Data Communications and Networking”, 5th Edition, Tata McGraw – Hill, 2013.

SUGGESTED READING:

1. Andrew S. Tanenbaum, “Computer Networks”, 5th Edition, Pearson Education, 2011.
2. LL Peterson, BS Davie, “Computer Networks: A Systems Approach”, 5thEdition, Morgan-Kauffman, 2011.
3. JF Kurose, KW Ross, “Computer Networking: A Top-Down Approach”, 5thEdition, Addison-Wesley, 2009.
4. W Stallings, “Cryptography and Network Security,Principles and Practice”, 5thEdition,

23MCE105

CLOUD COMPUTING

(PROFESSIONAL ELECTIVE-II)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC109 and 23MCC115

COURSE OBJECTIVES: This course aims to

1. To understand the requirement, demand, and the concepts of cloud computing
2. To evaluate the services & various architectures in cloud to meet the clients perspectives

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Identify the basic components of cloud computing and resource sharing
2. Assess the deployment & delivery models in cloud environment to support the client's requirements.
3. Appreciate various cloud infrastructure mechanisms, virtual server's role and utility to the need of the hour.
4. Evaluate the role, design and implementation of various cloud architectures to provide the best services.
5. Analyze the role and functionalities of IaaS, PaaS, SaaS services from consumers perspective

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	2	1	3	1
CO2	1	3	3	3	3	3
CO3	2	3	3	2	2	2
CO4	2	3	2	2	3	3
CO5	1	3	3	3	3	2

UNIT-I

Fundamental Cloud Computing-Understanding Cloud Computing, Origins influences, Basic Concepts and Terminology, Goals, Benefits, risks, Challenges, Rolls and boundaries, Cloud characteristics, Cloud Delivery models, Cloud deployment models.

UNIT-II

Data center technology, Visualization Technology, Cloud Security-basic terms and concepts, Threat agents, Cloud security threats, CSRMM.

UNIT-III

Cloud Infrastructure Mechanisms-Logical network perimeter, Virtual server, Cloud Storage device, cloud usage monitor, Resource replication, cloud management mechanisms, cloud security mechanisms, Cloud remote administration system.

UNIT-IV

Cloud Computing Architectures-Work load distribution architecture, Dynamic scalability architecture, service load balancing architecture, hyper cluster architecture, load balanced virtual server instances architecture, zero down time architecture, Rapid provisioning architecture, cloud balancing architecture, Resource reservation architecture

UNIT-V

Working with cloud perspectives - (Cloud Provider Perspective) Building IaaS Environments, Equipping PaaS Environment, optimizing SaaS Environments. (Cloud consumer perspective)- Working with IaaS Environments, working with PaaS Environment, working with SaaS Environments.

TEXT BOOKS:

1. Thomas Erl, Ricardo Puttini “Cloud Computing: Concepts, Technology & Architecture”, Prentice Hall, 1st Edition, 2015
2. Rajkumar Buyya, James Broberge and Anddrzej, M Gosciniski “Cloud Computing Principles and Paradims”. Wiley Publishing, 2011

SUGGESTED READING:

1. John W Rittinghouse, James F.Ransome. “Cloud Computing Implementation, Management and Security” CRC Press, 2009.

23MCE106

BIG DATA ANALYTICS
(PROFESSIONAL ELECTIVE-II)

Instruction	3L +1T Hours per week
Duration of Semester-End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC103, 23MCC106 and Problem Solving Skills

COURSE OBJECTIVES: This course aims to

1. To introduce the concepts and challenges of big data, the role of HDFS in handling big data, and Map-Reduce Architecture.
2. To introduce the features of NoSQL and study the working mechanisms of MongoDB, Pig, and Hive

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students would be able to:

1. Outline the fundamentals of various big data analytics techniques.
2. Analyze the Map-Reduce programming model for better optimization
3. Develop applications using the Map Reduce framework to solve real-world problems
4. Develop data models using NoSQL Database - MongoDB.
5. Experiment with Big Data applications using Pig and Hive

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	2	3	2
CO2	3	3	3	1	2	2
CO3	3	3	2	3	2	2
CO4	3	2	3	1	2	2
CO5	3	3	3	2	2	2

UNIT - I

What is Big Data? Why Big Data Important: When to consider a Big data solution, Big Data use cases: IT for IT Log Analytics, The Fraud Detection Pattern, Social Media Pattern. The Hadoop Distributed Files system: The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems, Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow, Anatomy of a File Read, Anatomy of a File Write, Coherency Model, Parallel Copying with distcp, Keeping an HDFS Cluster Balanced

UNIT - II

MapReduce: A Weather Dataset, Data Format, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner Functions, Running a Distributed MapReduce Job Developing a MapReduce Application: Writing a Unit Test with MR Unit, Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging a Job, Launching a Job, The MapReduce Web

UNIT – III

How MapReduce Works: Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures, Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort, The Map Side, The Reduce Side

UNIT – IV

No SQL Databases: Review of traditional Databases, Need for NoSQL Databases, Columnar Databases, Failover and reliability principles, CAP Theorem, Differences between SQL and NoSQL databases, Working mechanisms of Mongo DB: Overview, Advantages, Environment, Data Modeling, Create Database, Drop Database, Create collection, Drop collection, Data types, Insert, Query, Update and Delete operations, Limiting and Sorting records, Indexing, Aggregation

UNIT – V

Pig: Installing and Running Pig, an Example, Generating Examples, Comparison with Databases, Pig Latin, User-Defined Functions, Data Processing Operators, Pig in Practice. **Hive**: Installing Hive, The Hive Shell, An Example, Running Hive, Comparison with Traditional Databases, HiveQL, Tables, Querying Data, User-Defined Functions, Writing a User Defined Functions, Writing a User Defined Aggregate Function.

TEXT BOOKS:

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media Inc, 2015.
2. Paul C. Zikopoulos, Chris Eaton, Dirk DeRoos, Thomas Deutsch, George Lapis, "Understanding Big Data - Analytics for Enterprise class Hadoop and Streaming Data", McGrawHill, 2012.
3. Kristina Chodorow, "MongoDB: The Definitive Guide-Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Media, 2013

SUGGESTED READING:

1 Chuck Lam, Mark Davis, AjitGaddam, "Hadoop in Action", Manning Publications Company, 2016.

2 Alex Holmes," Hadoop in Practice", Manning Publications Company, 2012.

3 Alan Gates, "Programming Pig", O'Reilly Media Inc, 2011.

4 Edward Capriolo, Dean Wampler, and Jason Rutherglen, "Programming Hive", O'Reilly Media Inc, October 2012.

5 Vignesh Prajapati, "Big data Analytics with R and Hadoop", Packt Publishing, November 2013.

23MCE107

DISTRIBUTED APPLICATION DEVELOPMENT

(PROFESSIONAL ELECTIVE –II)

Instruction	3L +1T Hours per week
Duration of Semester-End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC107, 23MCC103 and 23MCC106.

COURSE OBJECTIVES: This course aims to

1. To provide good understanding of latest web technologies on client side components like ReactJS, Angular2, web frameworks, develop server side web applications like Node.js and Express.
2. To develop innovative web applications using various technologies.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Understand the database connectivity and application servers.
2. Explore the type of forms with validations using ReactJS.
3. Utilize Express framework to develop responsive web applications.
4. Demonstrate the architecture and file system of NodeJs.
5. Identify the significance of component intercommunication with Angular2.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	3	3	1	1	3
CO2	1	2	2	1	1	2
CO3	2	3	3	3	3	3
CO4	1	2	3	1	1	3
CO5	1	2	2	1	1	3

UNIT - I

Introduction to Full stack development and NoSQL MongoDB: Basics, Configuring Server and Client, MongoDB Compass, Creating Database, MongoDB Commands, MongoDB CRUD Operations. REST: Introduction to REST and API, REST Constraints, Representations, Resource Identifier, REST Actions,
Status Codes.

UNIT - II

NodeJs: Introduction, NodeJS Features and Drawbacks, setup Environment for NodeJs, NodeJS Program architecture, NodeJS Web Server, NodeJS Global Objects, NodeJS OS Objects, NodeJS Error Handling, Node JS Event Loop, NodeJS File System, Async and Sync, Connecting with Database, Handling CRUD Operations.

UNIT - III

Building an Express web application: Introduction to Express, Installation of Express, Create first Express application, the application request and response objects, configuring an Express application, rendering views, Authentication, Authorization.

UNIT - IV

Introduction to ReactJS: React Components, React State and Props Component intercommunication: Component Composition, pass data from parent to child, pass data from child to parent, Fetching data API using axioms, Types of forms, Form Validations, Posting Data, React Router, Building & Deploying React App.

UNIT - V

Introduction to Angular2: Angular2 Architecture (Component-Based Architecture), Consuming API, State Management, Validation, Routing. Passing data from parent to child and Passing data between siblings. Angular2 Specific**:** Directives, Modules, Components, Observables, Binding, Pipes, Dependency Injection.

TEXT BOOKS:

1. Amos Q. Haviv, MEAN Web Development, Second Edition, Packt Publications, November 2016.
2. Vasan Subramanian, "Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node", 2nd Edition, APress.

SUGGESTED READING:

1. Fernando Doglio, "REST API Development with Node.js", 2nd Edition, A Press.

23MCE108

SOCIAL NETWORK ANALYSIS

(PROFESSIONAL ELECTIVE –II)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MTC32 and 23MCE106

COURSE OBJECTIVES: This course aims to

1. To know various social network mining techniques
2. To identify the suitable graph for implementing social network.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Understand the basic concepts of social networks
2. Understand the various Ranking Algorithms
3. Understand the fundamental concepts in analysing the large-scale data that are derived from social networks
4. Implement mining algorithms for social networks
5. Perform mining on large social networks and illustrate the results.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	2	2
CO2	1	1	2	1	1	2
CO3	1	1	2	2	2	1
CO4	2	2	2	3	1	1
CO5	3	3	1	2	1	2

UNIT I

Introduction to Social Network Mining: Graph Models and Node Metrics. Introduction to social network mining. Illustration of various social network mining tasks with real-world examples. Data characteristics unique to these settings and potential biases due to them. Social Networks as Graphs. Random graph models/ graph generators (Erd¨os-R´enyi, power law, preferential attachment, small world, stochastic block models, kronecker graphs), degree distributions. Models of evolving networks. Node based metrics, ranking algorithms (PageRank). Gephi graph visualization and exploration software – practice.

UNIT II

Social-Network Graph Analysis: Social network exploration/ processing: graph kernels, graph classification, clustering of social-network graphs, centrality measures, community detection and mining, degeneracy (outlier detection and centrality), partitioning of graphs. SNAP system for large networks analysis and manipulation.

UNIT III

Social-Network Graph Analysis and Properties: Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs. Pregel paradigm and Apache Giraph graph processing system.

UNIT IV

Information Diffusion in Social Networks: Strategic network formation: game theoretic models for network creation/ user behavior in social networks. Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection. Opinion analysis on social networks: Contagion, opinion formation, coordination and cooperation.

UNIT V

Dynamic Social Networks: Applications and Research Trends. Dynamic social networks, Link prediction, Social learning on networks. Special issues in Information and Biological networks. Important applications of social network mining related to the above topics. Research trends.

TEXT BOOKS:

1 David Easley and Jon Kleinberg, Networks, crowds, and markets, Cambridge University Press, 2010.

2 Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman, Mining of massive datasets, Cambridge University Press, 2014.

SUGGESTED READING:

1 John Schermerhorn, Jr. James G. Hunt and Richard N. Osborn "Organizational Behavior", 10th Edition, Wiley India, Edition. 2009.

23MEO201

INTELLECTUAL PROPERTY RIGHTS

(OPEN ELECTIVE-I)

Instruction	3L per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: No formal pre-requisites

COURSE OBJECTIVES: This course aims to

1. Fundamental aspects of IP.
2. Salient features of IPR acts.
3. The methods of registrations of Intellectual property.
4. Awareness for innovation and its importance of protection.
5. The changes in IPR culture and techno-business aspects of IPR.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Understand the evolution of IP, working of organization's at global level to protect and promote IP.
2. Familiarize with the patent filing process at national and international level.
3. Draw the logical conclusion of research, innovation and patent filing.
4. Compare different kinds of IP and their patenting system.
5. Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	3	1	3
CO2	1	1	1	3	1	3
CO3	1	1	1	3	1	3
CO4	1	1	1	3	1	3
CO5	1	1	1	3	1	3

UNIT-I

Introduction: Definition of intellectual property, the need for intellectual property rights (IPR), kinds of intellectual property rights, IPR in India – genesis and development, IPR abroad, importance of WTO, TRIPS agreement, patent cooperation treaty, Berne and universal copyright conventions.

UNIT-II

Patents: Definition of patent, commercial significance , term of patent, patentable subject- matter, rights and obligations of patentee, searching of existing patents, drafting of patent, specification of patent, filing of a patent, the different layers of the patent system (national, regional and international options), compulsory licensing and licenses of rights, revocation of patents, differences between utility model and patent.

UNIT-III

Industrial Designs: Definition of designs, registration of design, rights and duties of proprietor of design,piracy of registered design. Trademarks: Meaning of trademarks, purpose of protecting trademarks, registration of trademarks, passingoff, assignment and licensing of trademarks, infringement of trademarks. Geographical indications: Definition, differences between GI and trademarks.

UNIT-IV

Copyright: Nature and scope of copy right, term of copyright, subject matter of copyright, rights conferred by copyright ,publication, broad casting, telecasting, computer program, database protection, assignment and transmission of copyright, infringement of copy right trade secrets and know-how agreement.

UNIT-V

Enforcement of Intellectual Property Rights: Infringement of intellectual property rights, enforcement measures, emerging issues in intellectual property protection, case studies of patents and IP Protection. Unfair Competition: What is unfair competition, relationship between unfair competition and intellectual property laws.

TEXT BOOKS:

1. 1.Ajit Parulekar and SaritaD"Souza, "Indian Patents Law – Legal & Business Implications", Macmillan India Ltd., 2006.
2. B.L.Wadehra, "Lawrelating to Patents, Trade Marks", Copyright, Designs & Geographical Indications, Universal law Publishing Pvt Ltd., India, 2000.
3. P.Narayanan, "Law of Copyright and Industrial Designs", Eastern law House, New Delhi, 2010.

SUGGESTED READING:

1. CronishW.R, "Intellectual Property Patents, Copyright, Trade Marks and Allied rights", Sweet & Maxwell,1993. 2. P.Narayanan, "Intellectual Property Law", Eastern Law Edn., 1997.

23MBO104

ORGANIZATIONAL BEHAVIOUR

(OPEN ELECTIVE-I)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

COURSE OBJECTIVES: This course aims to

This course aims to:

1. To familiarize the students with the basic understanding of individual behaviour and explore issues of motivation, communication, leadership, power, politics and organizational change.
2. To provide a comprehensive, up-to-date, practical knowledge base that provides an engaging introduction and concepts of organizational behaviour.
3. To orient the students with real life examples that correlate the theory to actual practice from the industry.
4. To enable the students to practically implement the Organizational Behaviour principles and practice in real time situations in their careers and life.

COURSE OUTCOMES: After completion of this course, student will be able to

Upon completion of this course, students will be able to:

1. Analyze the behaviour, perception and personality of individuals and groups in organizations in terms of the key factors that influence organizational behaviour.
2. Assess the potential effects of organizational-level factors on organizational behaviour.
3. Critically evaluate the potential effects of motivating and leading the individuals in the Organization.
4. Analyze organizational behavioural issues in the context of groups, communication.
5. Develop strategies to deal with power, politics and conflict issues at workplace.

CO-PO Articulation Matrix

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6
CO-1	-	1	-	2	2	1
CO-2	-	1	-	1	1	2
CO-3	1	2	1	2	1	1
CO-4	1	1	1	1	2	1
CO-5	1	1	1	2	1	1

UNIT – I

Introduction: Organizational Behaviour – Nature and levels of organizational behaviour – Individuals in organization – Individual differences – Personality and Ability – The Big 5 Model of personality, MBTI – Organizationally relevant personality traits. The nature of perception – characteristics of the perceiver, target and situation – perceptual problems, Attitude, Learning, IQ & EQ.

UNIT – II

Organization Structures and Culture: Concept of Organizational Structure– Types of Organizational Structure- Hierarchical organizational structure, Functional organizational structure, Horizontal organizational structure, Divisional organizational structures, Matrix organizational structure, Team-based organizational structure, Network organizational structure. Organizational culture and ethical behaviour – Understanding the dimensions of Culture, what do cultures do? Creating and sustaining culture, creating an ethical culture, managing change.

UNIT – III

Motivation and Leadership: Motivation–Concept of Motivation-Theories of Motivation-Maslow's Need-Hierarchy Theory, Herzberg's Motivation-Hygiene Theory, McGregor's Theory X and Theory Y, ERG Theory, Vroom's Expectancy Theory, Equity Theory. Leadership – Concept of Leadership, Leaders vs. Managers-Theories of Leadership- The Great Man theory of Leadership, Trait Theory of Leadership, Contingency Theory of Leadership, Situational Theory of Leadership, Behavioural Theory of Leadership, Presentation on Indian Leaders, Leadership issues in current business environment.

UNIT – IV

Group Behaviour: Concept of Groups- Stages of Group Formation- Work groups and teams, Team Building, Team Dynamics, Tuckmann model, Functional and dysfunctional traits of team development. Communication-Interpersonal Communication, organisational communication, roles, frameworks and barriers to effective communication, Transactional Analysis

UNIT – V

Power, Politics, Conflict and Negotiations: Power, Politics, Conflict and Negotiations–Sources of individual, functional and divisional Power. Organizational politics. Conflict – causes and consequences – Pondy's model of organizational conflict–conflict resolution strategies.

TEXT BOOKS:

1. Jennifer George and Gareth Jones "Understanding and Managing Organizational Behavior", Pearson Education Inc., 2021.
2. L.M. Prasad, "Organizational Behaviour", Sultan Chand & Sons; Fifth edition, 2014.
3. K. Aswathappa "Organizational behaviour", Himalaya Publishing House., 2013.

SUGGESTED READING:

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, "Management and Organizational Behaviour", Pearson Education. Inc., Eighteenth Edition, 2018.
2. Richard Pettinger "Organizational Behaviour", Routledge, 2013.
3. John Schermerhorn, Jr. James G. Hunt and Richard N. Osborn "Organizational Behavior", 11th Edition, Wiley India, Edition., 2010.

23MEO202

HUMAN VALUES AND PROFESSIONAL ETHICS

(OPEN ELECTIVE-I)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

Pre-requisites: No formal pre-requisites

COURSE OBJECTIVES: This course aims to

1. Understand the significance of values in life.
2. Understand the need for value adoption and prepare them meet the challenges.
3. Develop the potential to adopt values, develop a good character and personality and lead a happy life.
4. Practice the values in life and contribute for the society around them and for the development of the Institutions/organization.
5. Understand the professional ethics and their applications to engineering profession.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. State basic values and the need for value education.
2. Analyze the situation and prioritize values for making right decisions in their personal as well as professional life.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. Demonstrate the knowledge of ethics at their work place and apply different theoretical approaches to solve ethical dilemmas.
5. Apply risk and safety measures in the engineering practice.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	1	1
CO2	1	1	1	2	1	1
CO3	1	1	1	1	1	1
CO4	1	1	1	3	1	1
CO5	1	1	1	1	1	1

UNIT-I

Concepts and classification of values –need and challenges for value adoption: Definition of values , concept of values, classification of values, hierarchy of values, types of values, espoused and applied values, value judgment based on culture , value judgment based on tradition , interdependence of values, need for value education ,findings of commissions and committees, corruption and illegal practices , science and technology without values, exploitation of nature, increasing use of violence and intoxicants , lack of education in values ,implications of education in values , vision for a better India, challenges for value adoption ,cultural, social, religious, intellectual and personal challenges.

UNIT-II

Personality development and values in life: Enlightened self-interest, accountability and responsibility , desires and weaknesses , character development, good relationships, self-restraint, spirituality and purity, the quest for character , tests of character , the key to good character ,values in life, building an ethical policy, integrating values in everyday life, archaic social values , parenting practices, critical thinking, analyzing and prioritizing values, practicing yoga and meditation.

UNIT-III

Practicing values for the development of society: Resentment management and self- analysis, positive thinking and emotional maturity, the importance of women , children and taking care of them, helping the poor and needy, fighting against addictions and atrocities, environmental awareness, working for the sustainable development of the society, values in education system, present scenario, engineering education, current trends, need for quality improvement, adoption of value education, principles of integrity, institutional development.

UNIT-IV

Basic concepts of professional ethics: Ethics, morals and human life , types of ethics, personal ethics, professional ethics, ethical dilemmas, Indian and global thoughts on ethics, profession, professional and professionalism, ethical role of a professional basic ethical principles, some basic ethical theories, use of ethical theories - science, religion ethics, genders and ethics, media and ethics, computer ethics, case studies on professional ethics, exemplary life sketches of prominent Indian personalities.

UNIT- V

Ethics in engineering profession: Engineering profession, technology and society, engineering as social experimentation, engineering ethics, ethical obligations of engineering professionals, role of engineers, engineers as managers, professional responsibilities of engineers, engineers responsibility for safety, a few case studies on risk management, conflicts of interest, occupational crimes, plagiarism, self-plagiarism, ethics audit, consideration for ethics audit, ethics standards and bench marking.

TEXT BOOKS:

1. Subramanian R., Professional Ethics, Oxford University Press, 2017.
2. Dinesh BabuS., Professional Ethics and Human Values, Laxmi Publications, 2016.
3. Nagarajan R.S., A Text Book on Human Values and Professional Ethics, New Age Publications, 2007.

SUGGESTED READING:

1. Santosh Ajmera and Nanda Kishore Reddy, Ethics, Integrity and Aptitude, McGraw hill Education Private Limited, 2014.
2. Govinda Rajan M., Natarajan S., Senthil Kumar V.S., Professional Ethics and Human Values, Prentice Hall India Private Limited, 2013.

23CEO102

DISASTER CONTROL AND RESPONSE

(OPEN ELECTIVE-I)

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	3

This course aims to

1. To equip the students with the basic knowledge of hazards, disasters, risks, and vulnerabilities including natural, climatic, and human induced factors and associated impacts
2. To impart knowledge in students about the nature, causes, consequences and mitigation measures of the various natural disasters
3. To enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters
4. To enable the students to understand and assimilate the impacts of any disaster on the affected area depending on its position/ location, environmental conditions, demographic, etc.
5. To equip the students with the knowledge of the chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of national and global conventions

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels
2. Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan
3. Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management
4. Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same
5. Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	1	1
CO2	1	1	1	1	1	1
CO3	1	1	1	1	1	1
CO4	1	1	1	1	1	1
CO5	1	2	1	1	1	1

UNIT- I

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster-Natural and manmade; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT- II

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Geographical based disasters: Tsunami generation, causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various hydro meteorological and geographical based disasters.

UNIT- III

Human induced hazards: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas tragedy; Management of chemical terrorism disasters and biological disasters; Radiological Emergencies and case studies; Cases studies related to major power breakdowns, fire accidents, traffic accidents, oil spills and stampedes, disasters due to double cellar construction in multistoried buildings.

UNIT- IV

Disaster Impacts: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects- gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT- V

Concept of Disaster Management: Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; risk analysis, vulnerability and capacity assessment; Post-disaster environmental response water, sanitation, food safety, waste management, disease control;Rolesandresponsibilitiesofgovernment,community,localinstitutions,NGOs and other stake holders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Textbooks:

1. Pradeep Sahni," Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh," Handbook of Disaster Management: techniques &Guidelines", Rajat Publication, 2008.
3. Ministry of Home Affairs". Government of India, "National disaster management plan, Part I and II"
4. K. K. Ghosh," Disaster Management", APH Publishing Corporation, 2006.

20MCC116

MACHINE LEARNING LAB USING PYTHON

Instruction	3 Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: 23MCC113

COURSE OBJECTIVES : This course aims to

1. To Demonstrate the various basic programming using python
2. To learn the string processing and file oriented programming using python.

Course Outcomes : After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Practice the basic programs using python
2. Demonstrate proficiency in handling loops and creation of functions.
3. Identify the methods to create and manipulate lists, tuples and dictionaries.
4. Implementation of supervised machine learning algorithms
5. Implementation of clustering oriented algorithms

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	2	1	2	1
CO2	1	2	2	1	2	1
CO3	1	2	2	1	2	1
CO4	2	1	1	2	1	2
CO5	3	2	1	1	2	1

1. a. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.
   b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
2. a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
   b. Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).
3. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
4. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
5. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]
6. Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
7. Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.
8. Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.

9. Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.
10. Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use __init__() method to initialize name, USN and the lists to store marks and total, Use getMarks() method to read marks into the list, and display() method to display the score card details.
11. Simple Linear regression: Predict the sepal length (cm) of the iris flowers
12. Implementation of k-Nearest Neighbour algorithm.
13. Implementation of SVM Classification using Binary class
14. Implementation of Decision tree
15. Implementation of K Means

TEXT BOOKS:

1. Al Sweigart,"Automate the Boring Stuff with Python",1st Edition, No Starch Press, 2015
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.

23MCC117

UNIFIED MODELING LANGUAGE (UML) LAB

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: 23MCC114 and concepts of Data flow & ER diagrams

COURSE OBJECTIVES:

1. To understand & appreciate the role and requirement of Visual modeling
2. To present a OOAD model of selected case study using 9 UML diagrams

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course the students will be able to:

1. Learn the browsing and 4 views of Rational Rose case tool.
2. Gained the knowledge of selecting a case study and implement visual modeling
3. Model use case diagram and class diagram with all 6 relations and able to design boundary, control, entity classes
4. Implement the structural modeling through collaboration diagram, Dynamic modelling through sequence diagram, State diagram, Activity diagram
5. Establish the system's architecture through the modelling of component diagram and able to model the overall system's hardware, networking and software implementation through the deployment diagram.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	2	1	1	3
CO2	2	2	2	2	3	3
CO3	1	3	3	2	3	3
CO4	1	3	3	2	3	3
CO5	1	3	2	2	3	3

List of UML Diagrams

1. Use case Diagram
2. Class Diagram
3. Object Diagram
4. Sequence Diagram
5. Collaboration Diagram
6. State chart Diagram
7. Activity Diagram
8. Component Diagram
9. Deployment Diagram

The students should finally submit a technical report on their implemented case study.

Text book:

1. Ivor Jacobson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Pearson Education, India, 2008.o

23MCC118

TECHNICAL SEMINAR

Instruction per week	3 hours per week
Continuous Internal Evaluation	50 Marks
Credits	1.5

Pre-requisites: Ability to understand the current software industry trends and accordingly be able to present any topic / problem

COURSE OBJECTIVES: This course aims to

1. Prepare a systematic and independent study of a state of the art technological topic in the broad area of his/her specialization.
2. Present the selected technical topic and deliver a seminar speech

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Conduct a independent technical study and survey on the selected technical topic.
2. Understand the importance & impact of the subject in software industry
3. Appreciate the relevance of the topic in modern day scenario
4. Learn the practical applicability of the features & functionalities of the topic
5. Deliver a speech and presentation of the study topic in front of the class and evaluating faculties.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	3	1	2	3	2
CO2	1	2	1	2	3	2
CO3	1	3	1	2	3	1
CO4	1	3	2	2	3	2
CO5	1	2	2	3	2	2

Oral presentation is an important aspect of technical education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to the following aspects of the seminar presentation. 1. Literature Survey. 2. Organization of the material. 3 Presentation of PPTs. 4 Technical writing. Each student is required to submit one page of synopsis of the seminar. Give a 15 minutes presentation followed by 5 minutes discussions / Question – Answer session. Submit a Technical report on the seminar topic with a list of references and slides used within a week. Seminars are to be scheduled in the 5th week of the semester. The sessional marks will be awarded to the students by at least two faculty members on the basis of an oral and written presentation as well as their involvement in the discussion.

23MCC119

INTERNSHIP

Instruction	4 weeks
Continuous Internal Evaluation	100 Marks
Credits	3

Prerequisite: Should analyze the current on demand technology in the industry and identify an appropriate Organization to get an opportunity to work on a live project

COURSE OBJECTIVES: This course aims to

1. Choose a relevant technical requirement in software industry
2. Implement the selected technical requirement as a project

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Conduct an independent feasibility study and survey on the selected technical domain.
2. Appreciate the industry point of view on the identified technical subject.
3. Analyze the requirement specifications.
4. Identify all the modules , interfaces , and implement the code
5. Present the technical documentation of the internship

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	3	2	2	3	2
CO2	2	3	2	2	3	2
CO3	2	3	3	3	3	3
CO4	1	3	3	2	2	3
CO5	1	1	1	3	3	3

The Curriculum includes the Internship for Students of four weeks' duration during summer vacation (at the end/after II Sem). The internship experience will augment outcome-based learning process and inculcate various project working attributes in a Student. Internships are educational and career development opportunities providing practical experience in a field or discipline.

The Students shall undertake the Internship during the summer vacation continuously for four weeks of duration in any Industry/ organization after seeking due approval from the Head of the Department. The award of credits for the Internship during summer shall be evidenced in the III Semester Grade Sheet.

Internship is compulsory for all the Students for the award of MCA degree and the guidelines for earning three (3 credits) by the student are furnished below:

Guidelines:

Procedure for granting permission to the student to carryout Internship by the Student, continuously for four (4) weeks duration from an organization during the summer vacation:

1. The Student needs to approach the Head of the Department with a request to carry out Internship, with the details of the Industry/Organization and the Department allocates one of the Faculty members as Guide.
2. The Guide will discuss with CEO/Director/HR/ Concerned person of that Industry/Organization on the following points:
   - Duration of the Internship
   - Nature of work to be carried out by the Student
   - Facilities to be extended to the student in the Industry
   - Requesting the industry Personnel to assign a guide or an in-charge to monitor the Student's work in the Industry.

- Number of work hours to be spent by the Student
- Preparation of the documentation/report by the Student
- To apprise the Industry Personnel that the Internship carries a weightage of three (3) Credits.

3. If the Department recommends then the Student is permitted to carry out Internship in that particular Industry/Organization, continuously for four (4) weeks during the summer vacation.
4. A copy of the confirmation / offer letter given by the Industry / Organization shall be maintained with the Department and with the Student.
5. Students on joining Internship at the concerned Industry/Organization should submit the copies of offer letter given by the Industry/Organization to the guide as well as Internship Coordinator in the department.
6. Students undergo Internship at the concerned Industry/Organization. The candidate should regularly submit his/her progress report to their respective Faculty guides. Guide/ Department level Technical Panel evaluate(s) the completion of internship at the end of Internship period.
7. Students will submit Internship report after completion of Internship.

Internship Report:

After completion of Internship, the Student should prepare a comprehensive report with regards to the learned, conduct and the implementation of internship. The Internship report should be signed by the Internship Supervisor (from Industry), Faculty Guide, and Head of the Department. The Internship report will be evaluated on the basis of following criteria:

1. Originality
2. Adequacy and purposeful write-up
3. Organization, format, charts/images/diagrams/models, language, style etc.
4. Variety and relevance of learning experience.
5. Practical applications, relationships with basic theory and concepts taught in the Course.

Monitoring and Evaluation of Internship:

The Internship of the Students will be evaluated in three stages:

1. Evaluation by Industry
2. Evaluation by Faculty Guide
3. Evaluation through Seminar Presentation/Viva-voce at the Institute.

Evaluation by Industry:

The Industry will evaluate the Students based on the Punctuality, eagerness to learn, Maintenance of Daily Diary, skill test etc. for 30 marks.

Evaluation by Faculty Guide:

Two midterm evaluations shall be done by the Faculty Guide. One evaluation at the end of third (2^{nd}) week of Internship and another at the end of 4^{th} Week of Internship are to be carried out by the Faculty Guide. The midterm evaluation will be based on the work carried out by the Student in Industry/Organisation and also Attendance record, daily diary etc. For awarding marks for midterm evaluations the guide has to coordinate with the guide from industry. The midterm evaluations are to be carried out for a maximum of 30 marks.

Evaluation through Seminar Presentation/Viva-Voce at the Institute:

The student will give a seminar based on his Internship report, before an expert committee/panel constituted by the concerned department as per norms of the Institute. Committee examines the Students work and performance and the Marks (Maximum 40 marks) are to be awarded.

The evaluation will be based on the following criteria:

1. Quality of content presented (8 Marks)
2. Proper planning for presentation (8 Marks)
3. Effectiveness of presentation (8 Marks)
4. Depth of knowledge and skills (8 Marks)
5. Outcome of Internship (Publication, presentation in conference, project proposal etc.) (8 Marks)

Seminar presentation will enable sharing knowledge and experience amongst students and Faculty and build Effective communication skills and confidence in Students.

The Department sends the performance of the Student to the Controller of Examinations (CoE) for awarding Grade/Grade points towards earning of three (3) Credits by the Student for Internship.

23MCE109

CYBER SECURITY
(PROFESSIONAL ELECTIVE-III)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC109 and 23MCC115

COURSE OBJECTIVES: This course aims to

1. To acquire knowledge of tools used in cybercrimes and laws governing cyberspace
2. To acquire knowledge of Network security and Cyber Forensics

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1. Identify different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
2. Apply Tools used in cybercrimes and laws governing cyberspace.
3. Infer the features of Cryptography and Network Security.
4. Interpret the Cyber Laws and use them accordingly.
5. Identify the importance of digital evidence in prosecution.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	2	1
CO2	1	2	1	1	1	1
CO3	1	1	1	1	1	1
CO4	1	1	1	1	2	1
CO5	1	1	1	1	1	1

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cybercrime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT-II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector; **Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, attacks on wireless networks.

UNIT-III

Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, classical substitution ciphers: Caesar cipher, play fair cipher, block cipher: Festal cipher, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

UNIT-IV

Cyberspace and the Law: The Legal Perspectives**:** Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT-V

Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics, Digital forensics tools Ready Reckoner.

TEXT BOOKS:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt., Ltd, 2011.
2. William Stallings, "Cryptography and Network Security Principals an Practice" 6th Edition, Pearson 2014

23MCE110

SOFT COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MTC32, 23MCE101 and Programming skill in C AND C++.

COURSE OBJECTIVES: This course aims to

1. To Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
2. To Familiarize the Neuro-Fuzzy modeling using Classification and Clustering techniques

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Elaborate the Evolutionary Computing.
2. Applications of Feedforward Neural Network
3. Summarize the uses of Associative Memory and Unsupervised Learning
4. Analyze the Classical Sets and Fuzzy Sets
5. Perform various operations on Rough Sets

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	1	2	2	1
CO2	2	1	2	3	2	1
CO3	1	2	1	2	1	2
CO4	1	1	3	2	2	1
CO5	3	2	1	1	3	2

UNIT – I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Fundamentals of Artificial Neural Network (ANN) : Introduction , Model of Biological Neuron , Mathematical Model of Neuron , ANN Architecture, Learning Rules, Learning Paradigms, Perceptron Network, Adaline and Madaline Networks, Applications of Neural Network.

UNIT –II

Feedforward Neural Network : Introduction , Back Propagation Network, Parameter Selection in Back Propagation Network, Local Minima and Global Minima, Merits and Demerits of Back Propagation, Variants of Back Propagation, Applications of Back Propagation Network, Applications of Radial Basis Function

UNIT –III

Associative Memory: Introduction, Auto associative Memory, Hetero-associative Memory, Bidirectional Associative Network, Applications of Associative Memory. Unsupervised Learning : Introduction, Winner-Takes-All Network, Learning Vector Quantization, Self-organization Map, Adaptive Resonance Theory, Neocognitron, Applications of Unsupervised Learning

UNIT –IV

Classical Sets and Fuzzy Sets : Crisp Sets , Fuzzy Sets: History and Origin , Fuzzy Sets: Basic Concepts , Paradigm Shift , Representations of Fuzzy Sets , Alpha-cuts , Basic Operations on Fuzzy Sets, Fuzzy Complements, Intersections, and Unions , Extension Principle for Fuzzy Sets , Intuitionistic Fuzzy Sets, Operations on Intuitionistic Fuzzy Sets, Alpha–Beta Cuts Crisp Relations and Fuzzy Relations : Crisp Relations, Fuzzy Relations , Binary Fuzzy Relations , Intuitionistic Fuzzy Relations.

UNIT –V

Rough Sets : Fundamentals of Rough Set Theory, Rough Approximations, Properties of Approximations , Measures of Accuracy, Topological Characterization of Imprecision, Rough Membership Function, Attribute Reduction , Approximation of Classification, Dependency of Knowledge, Rough Sets, Rule Induction, and Discernibility Matrix , Knowledge Representation, Knowledge Representation Systems, Decision Tables, Rule Induction , Discernibility Matrix.

TEXT BOOKS:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

REFERENCE BOOKS:

1. S. N. Sivanandam & S. N. Deepa, "Principles of Soft Computing", 2nd edition, Wiley India, 2008.
2. David E. Goldberg, "Genetic Algorithms-In Search, optimization and Machine learning", Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", Pearson Education, 2004.
4. G.J. Klir & B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI, 1995.
5. Melanie Mitchell, "An Introduction to Genetic Algorithm", PHI, 1998. 6. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw- Hill International editions, 199.

23MCE111

BLOCK CHAIN TECHNOLOGIES
(PROFESSIONAL ELECTIVE-III)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC101, 23MCC106 and concepts of Ccryptography.

COURSE OBJECTIVES: This course aims to

1 To understand the role, operations & the concepts of Block chain technologies
2 To evaluate the various transaction flows of bitcoin operations & landscape concepts

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, the students will be able to:

1 Identify the basic concepts , architecture , Ecosystem of Blockchain
2 Understand the various operations & transactions of Blockchain
3 Appreciate the security concepts , Encryption mechanisms & cybersecurity challenges
4 Evaluate the role, and process of Bitcoin concepts
5 Analyze the role and functionalities of Blockchain in modern-day scenario along with application of Blockchain landscapes

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	2	2	2	1
CO2	2	3	2	2	3	1
CO3	2	3	3	2	3	2
CO4	2	3	2	1	3	2
CO5	3	3	3	2	3	3

UNIT-I

Types of Distributed Ledger Technologies: Blockchain , Directed Acyclic Graph , Hash graph Holo chain , blockchain architecture , Decentralized identifier , Blockchain Ecosystem , Working of Blockchain , Blockchain Key Characteristics , Public & private blockchain.

UNIT-II

Transactions in Bitcoin Blockchain : Cryptocurrency Exchanges , bit coin operations , Smart Contracts Working of Ethereum , Working of Hyperledger , B2B Contract , Ethereum and Hyperledger Fabric Merits of Decentralized Applications.

UNIT-III

Encryption and Cybersecurity : Types of Cryptography , RSA Algorithm , Cryptographic Schemes, Common Cyberattacks , Key Cybersecurity Features , Pros and Cons of Blockchain in Cybersecurity real world applications of blockchain technologies

UNIT-IV

Introducing Bitcoin : Bitcoin definition Byzantine generals problem , the double-spending problem, Sybil attacks , Egalitarianism versus authoritarianism , Bitcoin—A user's perspective , private , public keys, Vanity & multi signature Addresses In Bitcoin , Transaction life cycle

UNIT-V

Landscape of Blockchain : Blockchain Applications in Real World , Supply Chain Management, Ledger operations , E – commerce , Distributed resources & IOT , Decentralized Streaming
Functional Mechanisms

TEXT BOOKS:

1 Rishab Garg " Blockchain for Real world Application " John Wiley & Sons publications, 2023 – 1st Edition

2 Imran Bashir " Mastering Blockchain", Pact publications – 2020 – 3rd Edition

SUGGESTED READING:

1 Andreas M. Antonopoulos "O'Reilly Publishing, 2017 - 2nd Edition.

23MCE112

DEEP LEARNING
(PROFESSIONAL ELECTIVE-III)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC113

COURSE OBJECTIVES: This course aims to

1. Describe the major differences between deep learning and other types of machine learning algorithms.
2. Explain the fundamental methods involved in deep learning, including the underlying optimization concepts (gradient descent and backpropagation), typical modules they consist of, and how they can be combined to solve real-world problems.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course the students will be able to:

1. Identify Suitable Neural Networks.
2. Optimization of Deep Models
3. Apply Convolutional Neural Networks on real world problems
4. Apply Sequence Modeling
5. Formulate Deep Learning Research

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	1	1	1	1
CO2	2	1	2	2	1	2
CO3	2	1	2	2	1	2
CO4	3	2	2	3	3	2
CO5	2	3	2	2	3	2

UNIT - I

Deep Feedforward Networks: Example Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms. Regularization for Deep Learning Parameter Norm Penalties Norm Penalties as Constrained Optimization. Regularization and Under-Constrained Problems Dataset Augmentation Noise Robustness Semi-Supervised Learning, Multi-Task Learning. Early Stopping Parameter Tying and Parameter Sharing Sparse Representations. Bagging and Other Ensemble Methods Dropout Adversarial Training. Tangent Distance, Tangent Prop, and Manifold Tangent Classifier.

Unit – II

Optimization for Training Deep Models: How Learning Differs from Pure Optimization Challenges in Neural Network Optimization, Basic Algorithms Parameter Initialization Strategies Algorithms with Adaptive Learning Rates Approximate Second-Order Methods Optimization Strategies and Meta-Algorithms.

Unit - III

Convolutional Networks : The Convolution Operation, Motivation Pooling , Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs , Data Types , Efficient Convolution Algorithms. Random or Unsupervised Features. The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

UNIT – IV

Sequence Modeling: Recurrent and Recursive Nets Unfolding Computational Graphs. Recurrent Neural Networks Bidirectional RNNs Encoder-Decoder Sequence-to-Sequence Architectures Deep Recurrent Networks Recursive Neural Networks. The Challenge of Long-Term Dependencies. Echo State Networks. Leaky Units and Other Strategies for Multiple Time Scales the Long Short-Term Memory and Other Gated RNNs. Optimization for Long-Term Dependencies. Explicit Memory. Practical Methodology Performance Metrics. Default Baseline Models Determining Whether to Gather More Data. Selecting hyper parameters. Debugging Strategies. Example: Multi-Digit Number Recognition.

UNIT – V

Deep Learning Research: Linear Factor Models Probabilistic PCA and Factor Analysis Independent Component Analysis (ICA) Slow Feature Analysis, Sparse Coding. Manifold Interpretation of PCA. Auto encoders Under complete Autoencoders Regularized Autoencoders Representational Power, Layer Size and Depth Stochastic Encoders and Decoders Denoising Autoencoders Learning Manifolds with Autoencoders Contractive Autoencoders Predictive Sparse Decomposition Applications of Autoencoders Representation Learning Greedy Layer-Wise Unsupervised Pretraining Transfer Learning and Domain Adaptation Semi-Supervised Disentangling of Causal Factors Distributed Representation Exponential Gains from Depth Providing Clues to Discover Underlying Causes .

TEXT BOOKS:

1. Ian Goodfellow, YoshuaBengio, “Aaron Courville, Deep Learning”, MIT Press, 2017.

SUGGESTED READING:

1 Nikhil Buduma, “Fundamentals of Deep Learning”, O’reilly Publications, 2017.
2 Valentino Zocca, GianmarioSpacagna, Daniel Slater, Peter Roelants, Python Deep Learning, PACKT, 2017.

23MCE113

CYBER FORENSICS
(PROFESSIONAL ELECTIVE IV)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC109 and 23MCC115

COURSE OBJECTIVES: This course aims to

1 To gain knowledge of various digital investigation process models and forensic tools
2 To gain knowledge of application of forensic science to computers and networks

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students will be able to:

1 Implement the need and principles of digital forensics.
2 Summarize various digital investigation process models.
3 Illustration about digital forensic tools.
4 Obtain and analyze digital information for possible use as evidence in digital forensics process.
5 Applying forensic science to computers and networks.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	1	1
CO2	1	2	1	1	1	1
CO3	1	1	1	1	1	1
CO4	1	2	1	1	1	1
CO5	1	2	1	1	1	2

UNIT – I

Foundations of Digital Forensics**:** Digital Evidence, Principles of Digital Forensics, Challenging aspects of Digital Evidence - The Role of computers in crime, Cyber Crime Law: European perspective.

UNIT – II

Digital Investigations**:** Digital Investigation process models, Applying Scientific method in Digital Investigations, Investigative scenario: Security breach, Handling a digital Crime scene: Fundamental Principles: Preparing Surveying and Preserving Digital Investigation.

UNIT - III

The role of Computers in violent crime: Processing Digital crime scene, Investigative Reconstruction, Digital Evidence as Alibi, Computer Intrusions.

UNIT - IV

Cyber stalking : Computer basics for Digital Forensics , Applying Forensics science to computers, Digital Evidence on windows systems, Digital Evidence on Unix systems.

UNIT - V

Network Forensics: Networks basics for Digital Investigators, Applying Forensics science to networks, Digital Evidence on physical and data link layers, Digital Evidence on Network and Transport layers.

TEXT BOOKS:

1 Eoghan Casey, “Digital Evidence and computer Crime”, Academic Press 3rd Edition.

2 E. P. Dorothy, “Real Digital Forensics for Handheld Devices”, Auerback Publications, 2013.

SUGGESTED READING:

1 J. Sammons, “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics Syngress”, Publishing, 2012.

2 E. Casey, “Handbook of Digital Forensics and Investigation”, Academic Press, 2010.

23MCE114

INTERNET OF THINGS
(PROFESSIONAL ELECTIVE – IV)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC115, 23MCE105 and 23MCC102

COURSE OBJECTIVES: This course aims to

1. To provide an overview of M2M, IoT and domain specific applications.
2. To understand the architectural overview of IoT and design constraints.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course the students will be able to:

1. Explain vision of IoT from a global context.
2. Demonstrate the Architectural Overview of IoT.
3. Explain the usage of Devices, Gateways and Data Management in IoT.
4. Interpret state of the art architecture in IoT and Design Constraints
5. Analyze the domain Specific Applications

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	1	1	1	1
CO2	2	2	1	1	1	1
CO3	1	2	1	1	2	1
CO4	1	1	1	1	2	1
CO5	2	2	1	1	1	1

UNIT -I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

UNIT –II

M2M to IoT-An Architectural Overview: Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals-Devices and gateways, Local and wide area networking, Data Management.

UNIT –III

M2M and IoT Technology Fundamentals: Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management. IoT Architecture-State of the Art – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and Architecture, IoT Reference Model.

UNIT –IV

IoT Reference Architecture: Introduction, Functional View, Information View, Deployment and operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT-V

Domain Specific IOTs: Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle, Commercial Building Automation-Introduction, Case Study: phase one-commercial building automation today, Case Study: phase two-commercial building automation in the future.

TEXT BOOKS:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

SUGGESTED READING:

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
2. Hakim a Chachi "Internet of Things (Connecting Objects)", Wiley – 2010.

23MCE115

EXPLAINABLE ARTIFICIAL INTELLIGENCE
(PROFESSIONAL ELECTIVE-IV)

Instruction	3L +1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC113

COURSE OBJECTIVES: This course aims to

1 To learn various quantifying uncertainty , and probabilistic reasoning
2 To understand the complex decisions , and reinforcement learning

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1 Develop an understanding of Quantifying uncertainty and probabilistic reasoning
2 Making a simple decisions on the basis of utility theory
3 Learning how to take complex decision and learning from examples.
4 Knowing knowledge in learning and learning various probabilistic models.
5 Understanding various reinforcement learning algorithms.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	1	1	1	1
CO2	1	2	1	2	1	2
CO3	2	3	2	1	2	1
CO4	2	2	3	2	2	2
CO5	3	2	1	1	2	1

UNIT – 1

Quantifying Uncertainty : Acting under Uncertainty , Basic Probability Notation , Inference Using Full Joint Distributions, Independence , Bayes' Rule and Its Use , The Wumpus World Revisited, Probabilistic Reasoning : Representing Knowledge in an Uncertain Domain , The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions , Exact Inference in Bayesian Networks , Approximate Inference in Bayesian Networks , Relational and First-Order Probability Models, Other Approaches to Uncertain Reasoning.

UNIT – II

Probabilistic Reasoning over Time : Time and Uncertainty , Inference in Temporal Models , Hidden Markov Models , Kalman Filters , Dynamic Bayesian Networks , Keeping Track of Many Objects.

Making Simple Decisions: Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility Functions, Multi attribute Utility Functions, Decision Networks, The Value of Information, Decision-Theoretic Expert Systems.

UNIT – III

Making Complex Decisions: Sequential Decision Problems, Value Iteration, Policy Iteration, Partially Observable MDPs, Decisions with Multiple Agents: Game Theory, Mechanism Design. Learning from Examples : Forms of Learning , Supervised Learning , Learning Decision Trees, Evaluating and Choosing the Best Hypothesis , The Theory of Learning , Regression and Classification with Linear Models, Artificial Neural Networks , Nonparametric Models , Support Vector Machines , Ensemble Learning. Practical Machine Learning.

UNIT – IV

Knowledge in Learning: A Logical Formulation of Learning. Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

Learning Probabilistic Models: Statistical Learning, Learning with Complete Data, Learning with Hidden Variables, the EM Algorithm.

UNIT – V

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning.

TEXT BOOKS:

1. Russel,S., and Norvig,P., (2015), Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall
2. Elaine Rich, Kevin Night, Shivashankar B Nair, "Artificial Intelligence",3rd Edition.,2008

REFERENCE BOOKS:

1. Yang, Q. (1997), Intelligent Planning: A decomposition and abstraction based approach, Springer Verlag, Berlin Heidelberg.

23MCE116

NATURAL LANGUAGE PROCESSING

(PROFESSIONAL ELECTIVE – IV)

Instruction	3L +1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	60 Marks
Continuous Internal Evaluation	40 Marks
Credits	4

Pre-requisites: 23MCC108, 23MCC113 and Compiler Design

COURSE OBJECTIVES: This course aims to

1. To learn the fundamentals of natural language processing and understand NLP's various text processing techniques.
2. To use Topic Modelling, Case Studies and apply the NLP techniques to IR applications.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course, students would be able to:

1. Explain the basic concepts of the Natural language processing pipeline and applications of NLP.
2. Illustrate various text representation techniques in NLP.
3. Analyze text classification techniques and deep learning basics to process natural language text.
4. Outline text summarization methods and example systems.
5. Demonstrate levels of NLP for several case studies & apply NLP Pipelines to solve real-world applications.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	1	2	1	2	1
CO2	2	3	2	1	2	2
CO3	3	3	3	2	3	2
CO4	3	2	3	2	3	3
CO5	3	3	3	2	3	3

UNIT – I

NLP: A Primer, NLP in the Real World, NLP Tasks, NLP Levels, What Is Language? Building Blocks of Language, Why Is NLP Challenging? Machine Learning and Overview Approaches to NLP, Heuristics-Based, Machine Learning, Deep Learning for NLP.

NLP Pipeline: Data Acquisition, Pre-Processing Preliminaries Frequent Steps, Advanced Processing Feature Engineering Classical NLP/ML Pipeline DL Pipeline Modeling, Evaluation of Models, Post-Modeling Phases.

UNIT – II

Text Representation Vector Space Models Basic Vectorization Approaches, One-Hot Encoding Bag of Words, Bag of N-Grams, TF-IDF, Distributed Representations, Word Embedding, Going Beyond Words, Distributed Representations.

UNIT – III

Text Classification Applications One Pipeline, Many Classifiers, Using Neural Embeddings in Text Classification Deep Learning for Text Classification Interpreting Text Classification Models.

Deep Learning for Text Classification CNNs for Text Classification, LSTMs for Text Classification

UNIT – IV

Topic Modelling Text Summarization, Use Cases Setting Up a Summarizer: An Example Recommender Systems for Textual Data Machine Translation Question-Answering Systems, Social Media, E-Commerce and Retail, Healthcare, Finance, and Law.

UNIT – V

Case Study on NLP Pipeline, Text Classification: Ticketing, E-commerce, Social media, health care, Recommender systems, and other applications of NLP

TEXT BOOKS:

1. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta & Harshit Surana "Practical Natural Language Processing: A Comprehensive Guide to Building Real world NLP Systems", O"Reilly Media, Inc., 1st Edition, 2020.
2. James Allen, "Natural Language Understanding", Bejamin Cummings, 2nd Edition, 1995.

SUGGESTED READING:

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

Online Resources:

1. https://nptel.ac.in/courses/106101007/
2. http://www.cs.colorado.edu/~martin/sp2.html
3. https://web.standford.edu/~jurafsky/sp3/

23MCC120

PROJECT WORK

Instruction	24 Hours per week
Semester End Examination	3 Hrs (Viva Voce)
Continuous Internal Evaluation	100 Marks
Semester End Examination	100 Marks
Credits	12

Pre-requisites: Knowledge of Software development life cycle, able to identify a domain in demand in software industry & accordingly choose the appropriate technology to implement the identified problem

COURSE OBJECTIVES: This course aims to

1 To understand the phases involved in software development lifecycle.
2 To identify the appropriate software industrial demand and accordingly develop the software project.

COURSE OUTCOMES: After completion of this course, student will be able to

After completion of the course the students would be able to:

3 Understand to capture project requirements from the client.
4 Analyze and implement software life cycle for the given requirements.
5 Design a real time solution for the given software requirement specifications.
6 Develop the solution for the chosen problem using the concepts and techniques in the curriculum.
7 Writes test cases and applies test case scenarios and record the entire development process.

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	1	3	3	2
CO2	1	3	2	2	3	3
CO3	2	3	3	2	3	3
CO4	2	3	3	2	2	3
CO5	2	3	2	2	2	3

Major Project Work has to be carried out by each student individually in a period of 15 weeks of duration. Students should submit a synopsis at the end of 2nd week in consultation with the Project Guide. The synopsis should consist of definition of the problem, scope of the problem and plan of action. After completion of 8 weeks students are required to present a Project Seminar on the topic covering the aspects of analysis, design and implementation of the project work to the committee consisting of two faculty members of MCA department in the college along with guide will evaluate the project and award internal marks. At the end of the semester the students are required to present their project work before the External Committee for Viva-Voce examination, in which each student will be awarded with marks.

The following is the rubrics followed for evaluation of Major Projects, Internal and External marks for IV semester.

Guidelines for awarding CIE (Max. Marks: 100)		
Evaluation by	Max. Marks	Evaluation Criteria / Parameter
Department Review Committee (DRC)	20	Review 1
	20	Review 2
	20	Review 3
Supervisor	10	Regular Work Progress
	10	Quality of the work which may lead to Publication
	10	Report Preparation
	10	Analytical/ Programming Skills

Guidelines for awarding SEE (Max. Marks: 100)		
Evaluation by	Max. Marks	Evaluation Criteria/Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Project execution & Documentation
	20	Quality of the Project ● Innovation, ● Applications, ● Scope for further study, ● Applications to Society
	20	Viva-Voce

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